

Arch.

Chas. Munroe

26 / 11 / 1906

CLINICAL ESSAYS
AND LECTURES

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BY

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NEW YORK



LONDON
J. & A. CHURCHILL
7 GREAT MARLBOROUGH STREET

1902

TO
PAST AND PRESENT STUDENTS OF
ST. BARTHOLOMEW'S HOSPITAL
IN REMEMBRANCE OF MUTUAL
WORK AND FRIENDSHIP

PREFACE.

IN the following pages I have embodied various Essays and Lectures which, from time to time, have been published in the *St. Bartholomew's Hospital Reports*, or *Journal*, the weekly *Medical Journal*, the *Transactions of the Clinical Society of London*, or elsewhere. I now venture to reprint them in a volume which I trust may seem none the worse for being short. The work is in no sense a handbook. Indeed, I hope it contains little that is to be found in the handbooks of the day. My object has been different. Any one who has had opportunities of acquiring information must, in the course of years, have something to add to what is already known in the diagnosis and the treatment of disease. And it seems right that for the opportunities he has enjoyed he should endeavour to make some return. I am only too conscious that while none of the

chapters are complete many are scarcely more than fragments. But to render them more full and orderly would need more time and leisure than I have at my disposal. If they serve, in however small a degree, any useful purpose, I shall be content.

I am indebted to Mr. James Berry for reading through the proof-sheets, and to Mr. W. Douglas Harmer for the preparation of a copious index.

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ON GROWTH AS AN AGENT IN THE PRODUCTION AND IN THE REMOVAL OF DEFORMITY.*

GROWTH has been defined as the increase of a part by the addition of material like that already existing in it. In its simplest form growth may be observed in the enlargement of a crystal. If a crystal of alum sulphate, for example, is placed in a saturated solution of that salt, it gradually increases in size as more and more alum sulphate is incorporated in it. Another equally familiar example is the growth of a bone in a young animal. The tibia, for instance, becomes larger and larger by the addition of more and more bone to its length and thickness. When normal growth is examined it at once becomes apparent that it takes place in conformity to type. This is illustrated in a remarkable manner in the case of crystals. A crystal of alum sulphate, when it is perfect, is, whatever its size and at all stages of its progress from small to large, always octohedral. But, further, if such a crystal is broken and is then placed in its mother solution, the defect is repaired, and at length it is restored to its typical shape and becomes once more a perfect octohedron.

* The Cavendish lecture delivered before the West London Medical and Chirurgical Society on June 24, 1898.

Here are casts of some crystals (No. 42B in the Museum of St. Bartholomew's Hospital) prepared many years ago by Sir James Paget to illustrate an experiment recorded by Jordan in *Müller's Archives*, 1842, page 46. A broken crystal of alum was placed in a solution of this salt, and in a few days "while the whole crystal had increased in size, the increase

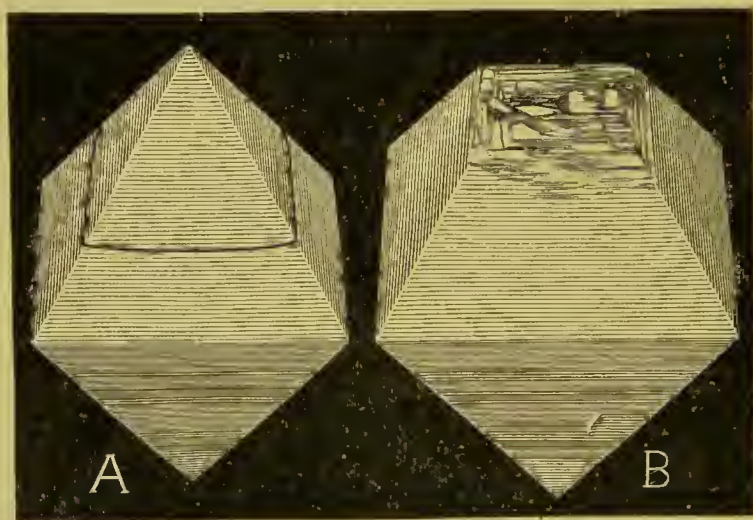


FIG. 1.—Repair of a crystal. A crystal of alum sulphate (B) was fractured at the level of the dark line shown on the other crystal (A). It was then placed in a solution of alum, and the part which had been broken off is seen to have been, in the course of a month, nearly re-formed.

on its broken surface was proportionately so much greater than on any other, that the perfect octohedral form was nearly regained." A few weeks ago, at my suggestion, Dr. Chattaway, in the Chemical Laboratory of St. Bartholomew's Hospital, selected two crystals of alum sulphate of the same size (Fig. 1, A and B), and then, breaking off a large piece from one, marked the other to show the line of fracture. When placed in a solution of alum the broken crystal, growing in correspondence with its type, had within

a month, to a great extent, as a glance at the two figures will show, regained its original shape.

In studying growth in the vegetable and animal kingdoms respectively, it is found that while the ultimate object is in both the same—namely, adaptation of the individual to its environment—an important difference may be observed. In plants the influence of type is comparatively limited; for there are numerous instances in which a plant, when its environment is changed, is able, as it grows, so far to adapt itself to the new conditions under which it is placed that it becomes modified in a remarkable degree. This is well seen when the land forms are compared with the water forms of the same amphibious species,* or when the habitat of a plant is changed from a cold to a hot climate. *Ricinus communis*, for instance, which is an annual in England, becomes a tall tree in Malta; while M. Freyn states that *Beta maritima* on the cliffs of Istria grows in shrub-like form, with erect stems, bearing hardly any resemblance to our cultivated beet.† Again, this capacity for adaptation to novel circumstances was graphically demonstrated by an experiment recorded by Dr. Lindley. A young willow tree had its crown bent down to the ground; this was covered with earth, and soon emitted an abundance of roots. The true roots were then carefully removed from the soil, and the stem inverted. The roots now became branches and emitted buds, and the tree grew ever afterwards upside down.‡

In animals, on the other hand, the law of con-

* "Origin of Plant Structures," by the Rev. George Henslow, 1895, p. 136.

† *Loc. cit.* p. 190.

‡ *Loc. cit.* p. 180.

formity to type exercises a much stronger influence, so that, although adaptive variation takes place in a series of generations, yet it is scarcely appreciable in the life of a single individual.

When at length the individual has attained its complete form and structure, and is thus in correspondence with the type which best equips it for the functions of its life, general growth, its purpose having been fulfilled, comes to an end. In man this stage has, generally speaking, been reached by about the twenty-first year when, as the phrase is, the individual "has done growing." Variations, however, in the directions both of deficiency and of excess may occur, so that the normal stature is either exceeded or not reached. Hence giants and dwarfs. Or the variation from the normal may be limited to a single part. In such cases, what has been termed formative power or germinal capacity is in local excess, with the result that such specimens as these of so-called congenital hypertrophy of fingers and toes are met with. Here is the cast of a hand (spec. Anatomical Series, xxxvii. 81, Museum St. Bartholomew's Hospital) the middle finger of which is five times its proper bulk; and this (spec. Anatomical Series, xxxvii. 81A) is a cast of the foot of a boy of thirteen. The foot was twelve inches long and at the instep eleven and a half inches in circumference. The great toe was four and a half inches long and had a circumference of six and three-quarter inches.

Yet on closer examination it is observed that, after general growth has ceased, the capacity for further growth in many parts still exists in a latent form, or

in reserve, but ready, should the interest of the individual require it, to be brought into activity. This provisional capacity for the growth of individual parts or organs after general growth has ceased, is one of the most striking and valuable resources with which the individual is endowed. General growth adapts the individual to its environment under normal conditions: while latent growth serves a different purpose; it provides means by which a part is enabled to keep pace with the increased demands which are made upon it, when either its own proper work is increased, or when some other part has become defective, so that, by its aid, the struggle for existence can still be maintained under circumstances which would otherwise in many cases soon lead to a fatal result. It is therefore in the highest degree protective or conservative. Thus such muscular organs as the heart, the large intestine, and the bladder grow stronger when they encounter abnormal resistance to the expulsion of their contents; and, to give minor instances, the epidermis thickens over points of increased pressure, and the cremaster grows into large fleshy bundles in cases in which a heavy tumour, such as hydrocele or irreducible hernia, is present in the scrotum. And here is a photograph of one of Sandow's pupils, whose muscles in the discharge of increased functions have grown to this extraordinary size (Fig. 2). The growth of the uterus during pregnancy is yet another remarkable example.

And, in the second place, organs grow when vicarious functions devolve upon them. For instance, one kidney, the other being absent or useless, may acquire twice its normal bulk. When one limb is paralysed

or lost in a young subject, the opposite grows to an abnormal size, and thus acquires abnormal strength. Note, again, the growth, till then latent, which takes place in the arteries of a limb when, after occlusion of the main trunk, a collateral circulation is established ; or in superficial veins when the deep veins have become obstructed. And it is chiefly those



FIG. 2.—The shoulder and arm muscles of one of Sandow's pupils.

organs and parts which are most essential to the welfare of the individual which manifest the largest share of this reserve power of growth ; for instance, in such indispensable organs as the heart or a remaining kidney, the capacity for latent growth is much more considerable than it is in parts which are not essential to the maintenance of life, such as a hand or a foot ; while the capacity for growth which the blood-vessels hold in reserve, in order to maintain

the vitality of a limb under very exceptional conditions, was recently illustrated by a case* recorded by Sir Thomas Smith, in which, when the femoral artery and vein, the profunda artery and vein, and the popliteal artery and vein were all simultaneously ligatured during the removal of a tumour in which they were involved, the enlargement by growth of collateral channels, both arterial and venous, was so considerable and so rapid that no serious embarrassment to the circulation occurred. Even in bone this reserve power of growth is very remarkable. Here is a skull,† the holding capacity of which is at least three times the normal amount. It is from a case of chronic hydrocephalus. Growth took place in order to avert intracranial pressure, which, without it, must soon have led to a fatal issue.

I have entered upon these general, and, I am afraid, too fragmentary, remarks in respect to growth in order to introduce the immediate subject of the present lecture. In what follows I propose to direct attention to the two forms of growth which I have mentioned—that by which the stature of the individual is originally attained, and that which, till the occasion arises, remains in reserve—in their relation to surgery, with the object of showing that they are agents of considerable potency, which, according to the conditions under which they act, may either lead to deformity, or conduce in an important degree to its removal.

Growth producing deformity is met with when the influence of the law of conformity of type, which ought to regulate the process, is interrupted or inhi-

* *St. Bartholomew's Hospital Reports*, vol. xxx. p. 223.

† *St. Bartholomew's Museum* (spec. No. 1).

bited by some other influence of a stronger kind. This state of things may occur under a variety of circumstances, and many examples can be easily named : I have already referred to cases of what has been termed congenital hypertrophy, in which parts grow in excess because they are endowed, not with the usual, but with an abnormal, amount of germinal power or formative capacity. Deformity from overgrowth, depending on an abnormal blood supply, is seen in those not very rare cases in which, owing to tuberculous disease of the knee, the growing ends of the femur and tibia are rendered more than normally vascular, and the limb becomes an inch, or, as I have seen it, two inches, longer than its fellow. The same result may follow inflammation of the shaft of a long bone—for instance, of the tibia. Thus in chronic tuberculous osteitis, or in acute infective inflammation followed by necrosis of part of the shaft, and by abnormal vascularity of the remainder, the bone may become as much as an inch and a half longer than the opposite. But the most remarkable example of deformity due to abnormal growth depending on increased blood supply, that I have seen, is furnished by Hunter's admirably ingenious experiment, in which the spur of a cock, which he transplanted from the leg into the much more vascular comb, grew to be six inches long (Fig. 3). The production of deformity when normal growth takes place under abnormal circumstances, is further illustrated by cases in which an injury of the lower end of the radius*

* This subject has been fully discussed by Mr. Jonathan Hutchinson, jun., in his able and instructive lectures at the College of Surgeons on Injuries to Epiphyses and their Results.

has been followed by arrested growth of the bone, and, as normal growth has continued in the ulna, the hand has been pushed over to the radial side. A similar result is met with in the lower limb, and many examples have been recorded. Two years ago I saw a young married lady whose left tibia was



FIG. 3.—The head of a Maltese cock, into the comb of which a spur had been transplanted from the leg, and had grown into the spiral horn six inches long, shown in the drawing. (Preparation in the Museum of the Royal College of Surgeons.)

three-quarters of an inch shorter than the right, and curved inwards just above the internal malleolus. The fibula was disproportionately long, so that its lower end, as the patient stood, was nearly an inch nearer the ground than its fellow. The external malleolus was prominent, and the foot was considerably turned in. The history of this case was that when the patient was six years old she injured her ankle by a fall—no doubt, as the result showed, separating the lower epiphysis of the tibia. Splints

were applied, and in a few weeks she was walking naturally. Deformity, however, was slowly developed, owing to continued growth of the fibula, while growth at the lower end of the tibia had been arrested by the injury which had involved the epiphysial line. I removed three-quarters of an inch of the fibula just above the malleolus and divided the tibia, and was then able to place the foot in its normal position. Mr. Walsham lately operated for a similar condition with an excellent result. The deformity present before the operation is well shown in this cast. Some years ago I met with a case of great deformity of the lower jaw in a boy aged nine. The teeth, instead of being vertical, were nearly horizontal, for during growth the jaw had been constantly drawn upon by a strong scar following a burn in the neck, in which the bone was firmly imbedded.

Further examples of growth resulting in deformity with which all are familiar are met with in the spine and in the tarsal bones. In the spine, in scoliosis developed in early life, growth is checked by increased pressure in the concavity, and favoured by diminished pressure in the convexity of the curves, so that the bodies of the vertebræ become wedge-shaped. In many specimens the vertical measurement of the bodies in the concavity is half an inch against an inch and a quarter in the convexity of the curve. In Pott's disease, when several of the vertebral bodies have been destroyed, the thorax, as growth proceeds becomes deformed, for the ribs, jammed together at their posterior ends and so becoming fixed, grow almost straight forwards and lead to extreme protru-

sion of the sternum. In talipes equino-varus, when this deformity is left without treatment, the tarsal bones are altered widely from their original shape. In the knee again, in tuberculous disease, if the joint has long been considerably flexed, or, as I have seen in a case of septic arthritis followed by fibrous ankylosis in a position of flexion, the front part of the condyles of the femur and of the head of the tibia grows in excess; and this change of shape may be so marked that it so far locks the bones as to become a considerable element of difficulty in the reduction of the deformity; while even if the deformity could be reduced the articular surfaces would be found so changed in shape that they would no longer admit of accurate coaptation in the extended position of the limb.

Growth, although it is in itself and in its surroundings perfectly normal, may produce a gradually increasing deformity. This is seen in the instance of scars. Thus vaccination-scars produced in infancy grow to scale with the limb on which they are placed, and become three or four times their original size. This growth of a scar I lately saw illustrated in a distressing manner in a case in which a nævus on the face had during infancy been treated by vaccinating its margin at four different points. The inoculations had all "taken," with the result that when the patient was a girl of eighteen she presented a group of four scars on her cheek, each of which was as large as a threepenny piece. As a further illustration of the growth of scars I may mention a case in which, some twenty years ago, I treated a cutaneous nævus on the face of an infant two months old with strong

nitric acid. The *nævus* was nearly round, and not much more than a quarter of an inch in diameter. As this patient grew the scar grew also, and a few weeks ago I found, on examining it closely, that—though being quite flat and smooth and of the same colour as the surrounding skin, it hardly shows—it is three-quarters of an inch in diameter, so that, growing to scale with the face, it has attained a very largely increased area.

I now pass on to consider growth as an agent not in the production, but in the removal of deformity. I have shown that in many cases when growth produces deformity, it does so under the influence of some condition which has supplanted or inhibited the action of the law of conformity to type. For instance, when growth continues in the ulna, after it has been arrested in the radius, in consequence of a fracture or other injury involving the epiphysial line at the lower end of this bone; or when the lower jaw has during growth been diverted from its typical shape by the dragging action of a burn-scar in the neck. In such cases, however, although the law of conformity to type is prevented from asserting itself by some more powerful adverse condition, it is merely suspended, but not abrogated; and is ready to resume its influence as soon as the agency which has opposed it is removed. It thus becomes a powerful corrective agent which surgery may often turn to very useful account.

Rickets.—The following case, which occurred in 1874, affords a good illustration. The bones of the lower extremities of a rachitic child aged seven, had during infancy yielded under the weight of the body,

and become so deformed that I determined to operate on the tibiæ, and then on the femora. To straighten the tibiæ, which were sharply curved forwards in their lowermost third, I performed osteotomy, first on one side, and then, after an interval of some months, on the other, and removed a wedge-shaped piece of bone from each. In those days aseptic surgery had not been fully established. Both wounds suppurated, and from both tibiæ small scales of necrosed bone slowly separated. Under these circumstances twelve months passed, and during the greater part of this period the child was kept off his feet. Then, when the femora were examined, it was found that, in the course of these twelve months during which the weight of the body had been removed, they had, under the undisturbed influence of the law of conformity to type, regained their normal shape, and that any resort to osteotomy was entirely unnecessary.

Again, it is frequently observed that the limbs of rickety children which for a time are markedly deformed subsequently "grow straight." I have seen a considerable bend disappear in the course of nine months. In such instances the original deformity takes place because, when the bones are deficient in rigidity, the weight of the body is a stronger influence than the law of conformity to type. But when, a year or two later, the rickety state has become less marked or has entirely ceased, and when the bones have regained their natural strength, they gradually, without surgical interference, grow straight. But sometimes the rickety condition is present in a more aggravated degree. In such cases the bones

under the weight of the body bend easily, and continue to do so for an extended period. And not only so, but growth itself is now an agent to increase their distortion ; the bones, in fact, "grow bent." Thus

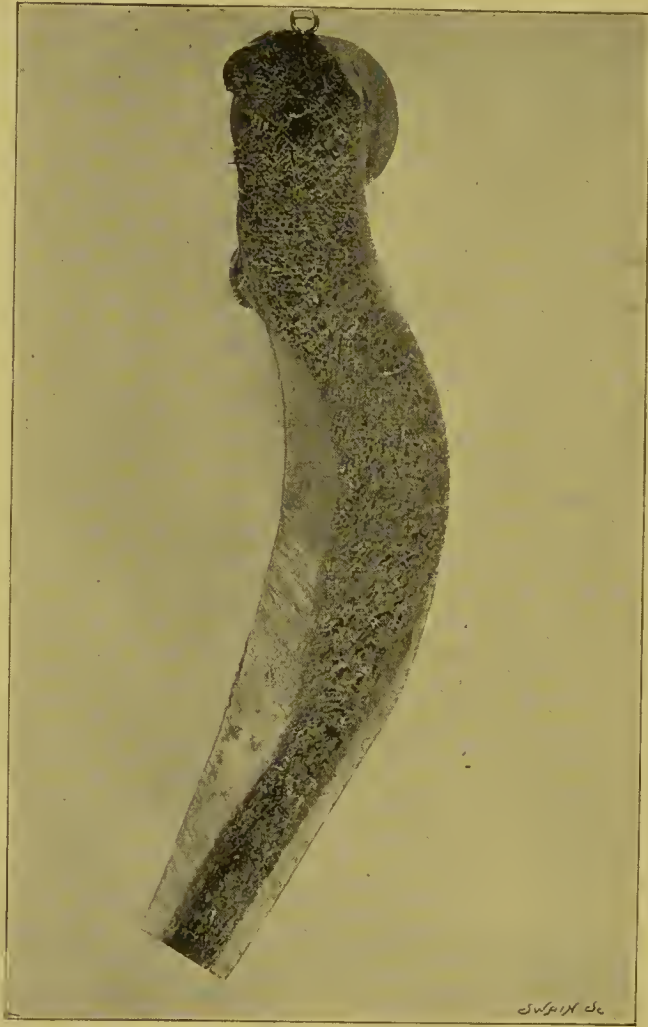


FIG. 4.—A rickety femur, showing a strong buttress of compact bone in the concavity of the curve.

thwarted in its normal course, the law of type is found to assert itself in another direction. Unable, in the circumstances, to restore a curved tibia to its normal shape by ordinary growth, it calls forth

the other form of growth I have mentioned—that which is latent or in reserve—and by its means develops a buttress in the concavity of the curve (Fig. 4), which effectually prevents any further bend—in other words, any further divergence from the normal type.

This reserve power of growth is present, it is interesting to notice, in a remarkable degree in plants.* Thus Hegler found that “the hypocotyl of a seedling sunflower, which would have been ruptured by a weight of 160 grms., bore a weight of 250 grms., after having been subjected for two days to the strain of a weight of 150 grms. The weight was subsequently increased to 400 grms. without injury. Leaf stalks of *helleborus niger*, which broke with a weight of 400 grms., were able to resist one of 3·5 kilogs., after having been subjected to a strain for about five days.” This increased strength was acquired by the rapid growth of the mechanical tissues of the plant in the form of supporting buttresses.

It must, however, be observed that although such a buttress (Fig. 4) prevents further deformity, it also prevents, or materially limits, the correction of the deformity already present by future growth, for it acts as a strong tie-beam, and, thus, often renders the curvature to a great extent permanent. These considerations have an important bearing on the treatment of deformities due to rickets. In their early stage these deformities can be easily limited or removed by treatment by which the rickety state is corrected, and by keeping the patient much off his feet, so that instead

* Henslow, *loc. cit.* p. 204.

of allowing the weight of the body to supersede the influence of the law of conformity of type, this latter force shall be free to exercise its normal influence on the result of growth. In the case I have mentioned above, the thigh bones, under favourable circumstances, although the deformity was very marked and tie-beam buttresses were present, grew straight within a year. A similar result was met with in the following instance. A child, three years of age, presented rickety deformity to an extreme degree, involving both the upper and lower extremities, all the bones of which were short, large at their articular ends, and so curved that a single, or perhaps a double, osteotomy of each would have failed to put them straight. The patient was placed in the country, fed on milk and fresh meat, ordered cod-liver oil, and kept entirely off his feet for eighteen months. At the end of this time his bones were practically straight, and he was allowed to be on his feet. This patient is now twenty-one; the deformity has disappeared; he is a groom, and, I am informed, is "very well and active." *

These cases will suffice to show that in its early stage before a buttress, acting as a tie-beam, has been developed, rickety deformity will be corrected by growth, if its normal course is secured by favourable circumstances. They show also that deformity is removed much more rapidly than is, I think, generally recognised. On the other hand, however, when buttresses have once been developed, though even then growth will usually tend to straighten

* I saw him a few weeks ago (August 1901). He is only five feet six inches in height, but all his bones are of normal shape.

the bones, its effect in this direction is greatly curtailed.

Fractures.—Fractures in the young not rarely escape detection, chiefly because many of them are of the green-stick—that is, incomplete—variety. Under such circumstances union is apt to be attended with considerable deformity. This is the case especially in the clavicle, but the same result is met with in green-stick fractures in the forearm, the thigh, and other parts. Now if these cases are kept under observation for twelve or eighteen months, it is found that as growth proceeds deformity, even although it was at first very considerable, gradually becomes less, and at length entirely disappears. Although fracture of the clavicle is a frequent accident in early childhood, and although union often occurs with the fragments in a bad position, it will be allowed, I think, that it would be difficult to find in children of six or seven one in whom any evidence remained to show that the accident had ever taken place. At the Children's Hospital, where I was formerly Surgeon, in dealing with green-stick fractures of the forearm united with deformity, I used at first to straighten the bones under chloroform, but afterwards I found that this method, unless the distortion was severe, was unnecessary; for the deformity became imperceptible in the course of six or nine months. But I am able to relate a case which offers conclusive evidence that after fracture in young subjects attended with deformity, as growth proceeds under the influence of conformity to type, the bone concerned may completely regain its normal shape. Some years ago I performed

Macewen's osteotomy in both femora for genu valgum in a child four years old. I have no record of the case

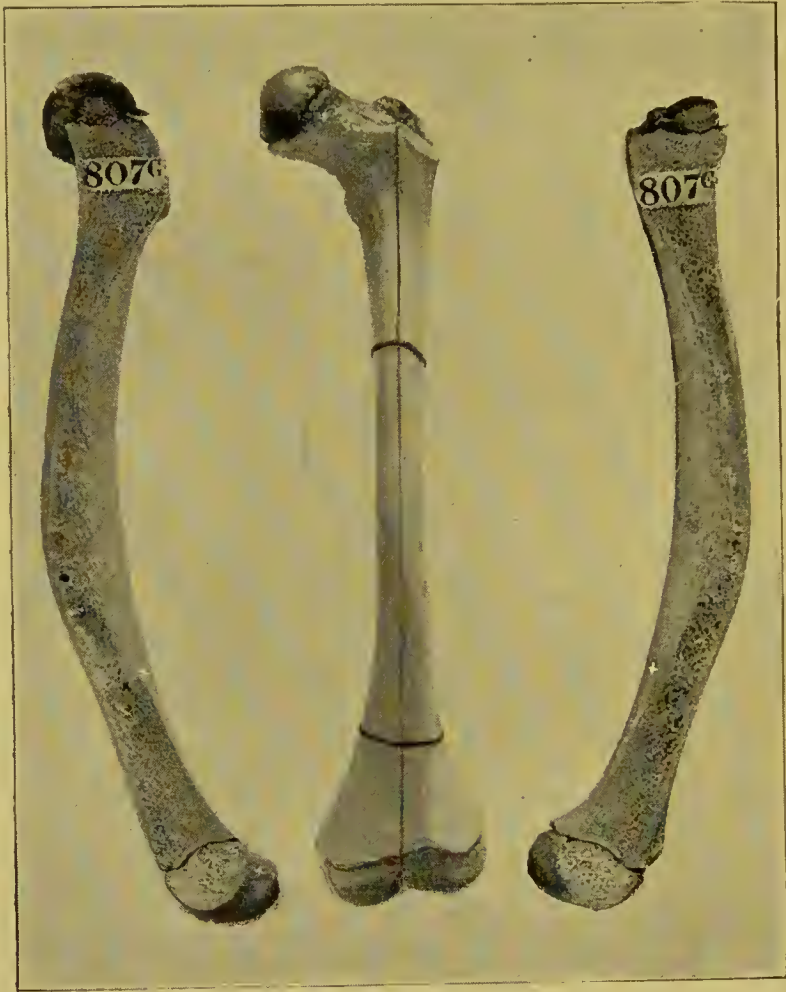


FIG. 5.—The left femur of a child, aged seven, on whom double osteotomy (Macewen's) for genu valgum was performed three years previously. The bone is markedly rickety, with an antero-posterior curve in the middle of the shaft. Before a section was made the seat of the fracture could not be ascertained. Looked at in front the shaft is perfectly straight. At a spot indicated by a small cross on the longitudinal sections, a faint trace of the fracture is still visible, in the form of slight thickening of the cancellous tissue (Museum, St. Bartholomew's Hospital, No. 807 G).

at the time of the operation, but as I never resort to this proceeding in any but somewhat severe examples

of knock-knee, the bones must after the operation have been put up in a position of considerable deformity. The child died three years later of measles, and this is one of the thigh bones (Fig. 5). It is of normal shape, and bears no trace whatever of the deformity which was produced by the osteotomy. Its longitudinal section, however, shows, at the situation indicated by a small cross, a projection of the wall of the shaft into the medullary canal, and this, no doubt, marks the point at which the bone was divided. This point, it is interesting to observe, is situated an inch and a half above the proper level for an osteotomy for knock-knee, a circumstance readily explained by the growth which took place in the lower end of the shaft between the operation and the death of the patient three years afterwards.

This complete disappearance of the deformity is very remarkable, and at first sight may seem scarcely credible. Yet is it not a result that we might, on reflection, be almost led to expect when we remember what takes place in the repair of fractures in adult bones in which the plastic agency of growth is absent? Here, for example (Fig. 6), is an adult femur in which a fracture has united with the fragments considerably overlapping each other. The specimen shows how strictly the process of repair has been governed by the law of conformity to type. The ends of the fracture, which were at first open, have been closed by the formation of bone exactly similar to that which forms the external layer of the normal shaft. All the internal callus has been removed so that the medullary canal has been restored, and the external callus, which was at first

present, has also been absorbed and all projections and irregularities of the surface have been removed,



FIG. 6.—Overlapped fracture of a femur, in which the ends have become closed by compact bone, and the callus by which the fragments are united has been modelled on the type of the original shaft (Museum, St. Bartholomew's Hospital Series iii., No. 98). Kindly lent by Messrs. Longinans.

while the callus which remains, to connect the overlapping ends, and which is about two inches in length, has acquired compact walls and a medullary cavity, so that it precisely resembles the type on which the original shaft was modelled. The imitation of type is throughout complete. Need we wonder, when we see how closely, even in the adult, bone-repair conforms to the original structure concerned, that, when the plastic element of growth is also present, conformity to type is well-nigh absolute?

The Spine.—The influence of growth in the removal of deformity is displayed in the spine in a degree which deserves particular notice. Scoliosis, so common in its slighter degrees in the young, usually begins between the ages of seven or eight and twelve or fourteen, but it may commence in quite early infancy

as the result of rickets, and, needless to say, unless proper measures are adopted the condition

tends to increase and become permanent ; for here, as in the case of the long bones, the weight of the trunk acting on parts diminished in rigidity becomes a stronger influence in controlling the results of growth than the influence of conformity to type, so that the normal shape of the column is exchanged for one of deformity. But those who have paid much attention to the subject are aware that in a large proportion of cases of scoliosis in children between eight and fourteen the curvature, in the course of two or three years, will completely disappear under favourable conditions — when good air and diet are secured, when overwork and constrained positions at school are avoided, and when an increased period of horizontal rest is provided (eleven or twelve hours at night, with an hour in the morning and an hour in the afternoon). When, with the accessories I have mentioned, the spine is also relieved by posture of the weight of the trunk for about half of the twenty-four hours, the result of growth is soon apparent—the spine, like a rickety femur or tibia, “grows straight.” The spine, however, differs from a long bone in an important respect. The shaft of a long bone, being all in one piece, is possessed of inherent stability, and is not, in its normal condition, dependent on external support ; while the spine, formed as it is of separate elements superimposed on each other, depends for support on the muscles and ligaments by which it is surrounded. While, therefore, the spine tends under the influence of conformity to type to grow straight when it is relieved of the weight of the trunk, yet as the surrounding muscles are weak the column

yields as soon as the patient assumes the upright position.

Another element, therefore, in treatment must consist in the development and strengthening of the muscles. This at the present day is secured by massage and exercises judiciously employed. The idea entertained by the public, and by some practitioners, that scoliosis is always serious and intractable, is to a great degree a misconception which has arisen from the traditions of former years, when the affection was either neglected or treated with heavy steel instruments in which the trunk was encased, and which were screwed up twice a week, or, on ordinary commercial principles, every other day. At the present time few surgeons so far ignore the rudiments of physiology as to apply steel instruments to push a scoliosis straight, as if they were pushing up the dead weight of a leaning wall, for it is clearly seen that the attempt to correct not only lateral deviation but rotation of the vertebræ by pressing in a horizontal direction upon the series of elastic arches formed by the ribs, always has been and always must remain a mechanical absurdity. Formerly the result of this treatment was to aggravate scoliosis to a very grave extent; but now that it has been discarded, the proportion of cases which become severe is greatly diminished. Indeed, clinical experience shows that in a large majority of instances scoliosis is not prone to attain any serious degree; and that when the treatment I have so briefly mentioned is adopted early, and is efficiently used, a very large proportion (70 or 80 per cent.) end in complete recovery.

In those cases, however, in which infants, as the result of rickets, develop scoliosis in the first or second year of life, prognosis is very unfavourable : for during the long period in which growth will continue, deformity is likely by degrees to become extreme. There can, I think, be little doubt that the grossly distorted skeletons which are to be found in every large museum are from subjects whose curvature began during early childhood when they were suffering from rickets and for whom no treatment was employed. No cases, I believe, more graphically illustrate the agency of growth in the production of deformity.

The treatment of infantile scoliosis is attended with great difficulty. Instrumental support cannot, it must be allowed even by those who approve of it in older patients, be applied when the abdomen is protuberant, the pelvis much smaller than the thorax, and the skin unfit to bear even slight pressure ; nor can exercises be employed with good effect. The case, however, is one in which growth as an agent in the removal of deformity may be turned to very good account. The spine must be placed under conditions in which it shall be able to "grow straight." The infant must, therefore, be kept very much in the horizontal position, and appropriately gentle massage must be persistently employed to develop and promote the nutrition of the spinal and other muscles. A case in illustration may be briefly related.

A rickety infant aged thirteen months, a patient of Dr. McCaskie, of Brompton, had lateral curvature with very marked rotation. The child's muscles were so weak that when he was placed in a sitting position the curvature was considerably increased. The

deformity, which had been noticed for three months, was rapidly getting worse. It was evident that, if matters were allowed to go on, in the course of a year or two, or even a few months, the deformity would become extremely grave, for the bodies of the vertebræ were abnormally soft, and by being compressed in the concavity of the curves would soon become wedge-shaped and otherwise distorted. The patient was therefore kept for nine months almost constantly in the horizontal position in a small wicker-work tray, in which he could be carried about, and gentle massage for the trunk and limb muscles was regularly employed. During this time the child remained in very good health and grew quickly, and at the end of the time the deformity, which had grown less and less marked, had so nearly disappeared that scarcely a trace of it remained. He was now allowed to sit up a little and be on his feet each day for a gradually extended period. He soon learned to walk, and when he was three he was running about in perfectly good health and strength, and with no return of his curvature. He is now a strong active boy of eleven, and his spine is quite normal. The long period during which the horizontal posture was maintained was, of course, a troublesome ordeal for the child's parents. For himself, he always took it in very good part. But I would ask, by what other means could the development of an aggravated scoliosis have been prevented?

In tuberculous disease of the knee, the joint is often considerably flexed, the head of the tibia is displaced backwards and outwards, and the leg is rotated outwards. This threefold deformity is, as every

surgeon knows, one which it is very difficult to correct. An attempt to straighten the limb by orthopædic apparatus involves, as I have pointed out elsewhere,* the use of leverage, and two objectionable results, unless great care is taken, are apt to follow. The head of the tibia may be forced still further backwards, and owing to the production of interosseous pressure the disease may be aggravated, and the joint rendered painful.

In cases of this description, provided the displacement is only moderate in degree, if the joint is enclosed in accurately modelled leather splints, and the patient is not allowed to walk on the limb, as time goes on the joint will "grow straight." In 1886 I saw a child, aged fourteen months, a patient of Dr. Buck, of Clapton, with acute tuberculous disease of the knee, attended with considerable swelling, heat, pain, and relaxation of the ligaments. The joint was flexed at an angle of about 100° , and the head of the tibia was displaced backwards and outwards to an extent that I have never seen corrected by any kind of apparatus. In so young a child it would have been a very difficult matter to use any apparatus for extension. The knee was therefore fitted with leather splints and kept at rest. These splints were uninterruptedly worn for the next four years. The joint gradually became more and more extended, the splints being remodelled about every six months to correspond with the improved position of the limb, and by the end of four years all trace of the displacement had disappeared, and the joint was in a position of complete extension, nor were its movements in the

* "Diseases of the Joints and Spine," 1895, p. 272 *et seq.*

least degree impaired. At the present time the joint is still sound, quite freely movable, and of normal shape. The only remaining defects are some muscular wasting and two inches of shortening, due, no doubt, to damage done in the course of the disease to the growing ends of the femur and tibia. In the later stages of a case of this kind the limb may with great advantage be placed in a Thomas's knee-splint. In this excellent appliance a broad webbing strap may be passed over the front of the thigh just over the knee, and another over the upper part of the tibia, and be so connected with the lateral bars of the splint that they assist in straightening the limb. By this means, without the production of any injurious interosseous pressure, the process of extension of the knee may be materially promoted, while the patient can move about on crutches and a patten on the other foot. It must be clearly understood that I do not suggest this method for the removal of deformity of the knee in the usual class of cases, when more active measures can be successfully employed. I have, however, from time to time met with cases in which it has led to results that could not, as far as I am aware, have been secured in any other way, and it is in exceptional cases that exceptional methods are often of the greatest value.

One further example may be related. A boy, aged three, had tuberculous disease of the knee-joint, with an abscess in the tibia which reduced the outer part of the head of the bone to little more than a shell, with the result that not only was the knee flexed, but the tibia was so deflected that a severe degree of knock-knee was developed. The distortion,

when I first saw the case, was such that there seemed no probability of straightening the limb except by excision—a very undesirable proceeding in so young a child. The joint was, however, with the double purpose of arresting the tuberculous process and preventing further deformity, put up in leather splints in anticipation that at some future period excision would be advisable. In the next year so great an improvement in the position of the limb occurred that splints of modified shape were applied on two occasions to keep pace with the altered shape of the joint, and a year later still, the deformity had so far disappeared that the joint was almost fully extended and only a trifling degree of genu valgum remained. The boy, after wearing the splints for another year, had a movable joint and a limb which was practically free from deformity, except that it was three-quarters of an inch shorter than its fellow. On this limb, the sole of his boot being a little thickened, he could walk with scarcely any appreciable defect. I feel sure that had excision been performed when the case first came under observation, or even at a later period, the result would have been very much less favourable.

I hope the observations which I have made will be sufficient to show, as I proposed at the outset, that growth is an agent, the tendencies and results of which must be fully taken into account in the clinical surgery of the young. This necessity arises from the fact that in the instances I have adduced, and in others that could be mentioned, various deformities are developed because conditions have arisen which have interfered with or superseded the law of conformity to type, under the regu-

lating influence of which growth normally takes place. When this is recognised it at once becomes apparent that treatment, if it is to be successful, must be guided by the principle of removing as far as possible the disturbing influence, whatever it may be, that is at work, and substituting for it those conditions by which normal growth shall be promoted to the greatest available extent. Nor, I think, can any principle be named which rests on a sounder foundation, or which in the true sense of the term is more directly conservative. Many forms of treatment which are properly named conservative are conservative in only a limited or qualified degree : for, although, under the circumstances, they undoubtedly secure the safety or promote the advantage of the individual concerned, they do so only by the sacrifice of parts or organs, the loss of which involves more or less serious disability or inconvenience ; while in the cases to which I have been alluding the surgeon, recognising in growth one of the most strongly operative of all the manifestations of life, and observing the marvellous results which are produced by its agency, makes it his endeavour to ascertain the conditions which are most favourable to it, and does his best to secure their full effect. It would not be difficult to mention plans of treatment which have done violence to Nature and her methods, and which have inevitably led to failure and disappointment, for *Natura non imperatur nisi parendo*. But the subject I have discussed may suffice to remind us of one of the chief rules of practice—that under which the surgeon makes it his object to act as the strict disciple of Nature, and render himself ancillary to her work.

THE ETIOLOGY OF MISTAKES IN DIAGNOSIS.

GENTLEMEN,—It is obvious that the results of your treatment must largely depend, in any given case, on the diagnosis that you have formed. Your opinion, in other words, as to what is the matter with a patient determines to a great extent what you do for his relief. Yet, that diagnosis is often at fault—either positively erroneous, so that the symptoms observed are attributed to one cause when they are really due to some other ; or incomplete and inadequate, so that the condition really present is not detected—is a truth with which every one is only too familiar. Now I think it may be useful to study the various causes to which these defects of diagnosis are due—to endeavour to ascertain how it is that mistakes are apt to occur. Before we enter upon this act of penance, however, we may fairly remember that great advances in accurate diagnosis have been made in many directions in the course of the last few years.

1. It behoves us all to recollect that *our acquirements may be deficient*. We may be ignorant of what others know, because either our opportunities, or our diligence and attention, have failed us. Or

our powers of observation are deficient and our perception is obtuse, so that we do not notice what others see at once. An Indian hunter sees a footprint in his path, or a curl of smoke on the horizon, or he hears a sound which others cannot detect. Wild animals are keen observers: nothing escapes their notice. Our special senses, unless we train them carefully, are poor and rudimentary in comparison with theirs. Yet our sight, our hearing, and our sense of touch may be developed to a high degree of perfection by cultivation. This is best seen when they undergo what may be termed compensatory development. In a blind man the senses of hearing and of touch become so enlarged and intensified that the loss of sight is to a striking extent made good. Yet how few of us adopt the systematic practice of educating our special senses; our sense of sight, for instance, by a standing habit of studying a picture or some other object until we feel sure we really see all that it presents. How often should we have to answer the question, "Did you notice so and so?" by confessing "No, I am afraid I did not." It has been well said that "*the eye sees what the eye brings the means of seeing.*" How keen and highly trained must the faculty of observation be in a great portrait painter. How completely he must see what there is in a face before he can produce a true likeness. In the diagnosis of a case one man will see things which will guide him at once to a correct conclusion. To another, these things, and what they plainly indicate, are as if they did not exist. He completely overlooks them. I remember at a clinical examination at the College of Surgeons showing a

candidate a diseased knee-joint, and asking for his diagnosis of the case. The affection was osteo-arthritis. But I had no sooner asked the question than the patient placed his hand, all the finger-joints of which were enlarged and distorted so that they presented a typical example of the disease, on the front of his thigh within six inches of the knee. With this tell-tale hand in this position I felt it was useless to pursue the question further. Here, however, I was wrong, for the candidate came to the conclusion that the disease was tuberculous. He did not in fact *see* the hand on which "osteo-arthritis" was so plainly inscribed.

The following story is an old one ; nor can I fully vouch for its literal accuracy. But in spite of both these drawbacks, it may still convey a useful lesson. While a quack in a country town was seeing his patients, a woman of thirty-five, who was a complete stranger to him, entered his room and handed him a bottle of urine. After he had inspected the bottle carefully, the following dialogue, history informs us, occurred : " This is your husband's ? " " Yes." " He is older than you are—he is over sixty ? " " Yes, he is sixty-four." " He is a tailor ? " " Yes." " You come from—— ? " (naming a village three or four miles off). " Yes." Now, how did he arrive at all these facts ? He was a shrewd man, and one who had long cultivated the faculty of close observation. He saw that the woman was married, for she wore a wedding ring. Her husband was living, for she was not in widow's weeds. The specimen did not refer to her own case, for she was evidently strong and

well. Probably the urine was her husband's. Floating in the bottle he saw a gray hair. This suggested that her husband was old. He saw some "list" (the selvage of cloth) rolled round the cork to make it fit the bottle. This list would be mere waste in a tailor's shop, but rare elsewhere. This indicated that the man was probably a tailor by trade. He noticed that she had some light-coloured loam on her boots, which was to be found in one place, and one place only, in the neighbourhood—the village he had named. Now, although this man was "only a quack," his performance was admirable. Let us learn from him, and remember that no man who does not very carefully train his powers of observation can be completely equipped as a practitioner of medicine or surgery. Many mistakes are the direct outcome of defective observation, or of the deficient cultivation of the special senses.

2. *Instead of being alert, watchful, and critical, you are careless, inattentive, and off your guard.* In this slack state of mind you may easily overlook a dislocation of the humerus in a stout subject, a Colles' fracture without much displacement, or a small femoral hernia.

3. In a difficult case *you omit to repeat your examination* when the conditions which at first masked the real state of affairs—such conditions as swelling, severe pain in the part, want of daylight, or the general state of the patient—are removed. A boy of ten, for example, has fallen upon his elbow. When you see him an hour afterwards, and in the dusk of the evening, it may be impossible on account of the swelling to tell what injury has occurred. Or

a man is admitted into the hospital when he is tired and jaded so that he looks ill, and his extremities are blue with cold. You find he has a very ugly-looking swelling involving the lower third of his fibula, and you have no doubt the disease is sarcoma. Now if, in these two cases, you pursue your diagnosis no further, you will in all probability treat both of them wrongly, and will materially injure both your patients. In the one case you will act in ignorance of the fact that the boy has sustained a fracture involving his elbow-joint ; in the other you will mistake a large periosteal gumma for a sarcoma, and you will fail to prescribe potassium iodide, which would quickly remove the swelling ; or you may even amputate a limb that ought never to have been removed. If, on the other hand, you proceed to complete your diagnosis when circumstances have become more favourable—when, in the first case, swelling has subsided after the limb has been placed in a favourable position, and when the patient is, if necessary, under an anæsthetic ;* when, in the second case, the swelling has by rest, warmth, and position of the limb been reduced, so to say, to its simplest terms, and when you have learned by going into his history that the patient is affected with tertiary syphilis—you will have no difficulty in arriving at a correct conclusion.

4. *You omit to revise your diagnosis.*—You forget that a case, as it goes on, may undergo a radical change—that some entirely new element may be introduced. Forgetting this, and as your mind is settled as to the diagnosis, you allow the change that has occurred completely to escape your notice. You

* You will of course if possible obtain a skiagram.

are, for instance, attending a patient for gonorrhœal orchitis, or a boy for a severe sprain of the wrist. Now, in both cases—and I have myself seen examples of the occurrence—the parts concerned may become tuberculous. But unless you are in the habit of revising your diagnosis, the development of this new element, this radical change in the nature of the affection, may totally escape your observation. It is only when much valuable time has been lost, and when the condition at length forces itself upon your notice, or when perhaps your diagnosis is revised by some one else, that your oversight is detected. This engrafting of a new and widely different element upon a case in which the original diagnosis was quite obvious may very easily entrap you. I have seen the following among many illustrations of it. A woman had an ordinary abscess in the breast after her infant was weaned. The abscess was opened in due course, and a drainage-tube was inserted. A sinus remained, discharging a small quantity of pus. At the end of four months, when the patient first came to the hospital, it was quite clear that, occupying the situation of the deeper part of the abscess, was a large carcinoma (p. 245). A man, with stricture of long standing, had several urinary fistulæ traversing his scrotum. He had been many months in this condition. At length, however, swelling of the scrotum rapidly increased, and it became plain that a malignant growth was in process of development. Sir James Paget* tells that “a boy fell and struck his knee. It had been perfectly healthy, but the inflammatory swelling (as it was supposed) that fol-

* “Surg. Pathol.,” 1870, p. 685.

lowed the fall did not subside—rather it constantly increased, and in a few weeks it became probable that a large medullary tumour” (doubtless the growth was really a periosteal sarcoma) “was growing round the lower end of the femur. Amputation proved this to be the case.” He also relates that “a sturdy man, at his work, slipped, and strained, or perhaps broke, his fibula. Three days afterwards he had increased pain in the injured part, and at the end of a week, swelling . . . constantly increased. Eight weeks after the injury the swelling was found to be a large medullary growth” (periosteal sarcoma?) “around and within the shaft of the fibula, and the limb was amputated.” I have myself seen a sarcoma develop at the site of a recent fracture of the humerus.

5. *You overlook some possibility which you ought to have taken into account.*—Thus, in a case in which the patient has angular curvature of the spine, you think only of Pott’s disease; you forget that either primary sarcoma, or carcinoma secondary to that disease of the breast or some other part may also produce angular curvature. Two examples of this oversight, and in which angular curvature was due to malignant disease, have recently come under observation. Or in a case of abscess in the floor of the mouth you overlook a salivary calculus. Or you overlook the fact that acute cystitis may be due to gout, or that pruritus vulvæ may be caused by diabetes. An amusing illustration of this kind of oversight is afforded by the following anecdote. A patient, many years ago, presented symptoms for which it was found hard to account. Amongst them was a contracted

and fixed pupil of one eye. The old family butler having heard this symptom earnestly discussed on two occasions, said to one of the learned doctors while a third consultation was going on, "Please, sir, I don't know if it makes any difference, but master has got a glass eye."

6. *The governing facts of the case are not as you suppose.*—In other words, your premises are wrong. A sufficiently good example of this is found in an incident which came under the notice of Sir Thomas Smith. An individual who had more money than either good manners or self-control, was assisted from his dining-room to his bedroom, where he fell heavily asleep. Shortly afterwards he greatly alarmed his wife by the difficulty of his breathing, which seemed to her to indicate more than mere intoxication. As his false teeth, which he usually, on going to bed, left in his dressing-room, were nowhere to be found, his wife feared they had slipped down his throat; she therefore sent off the groom post-haste for the doctor, who, when he came, made immediate preparations for extracting the foreign body. At this juncture, however, the butler came into the room with the teeth on a silver salver, and said he had found them stuck in the pine-apple. Some years ago a man was brought to one of the London hospitals, having met with a severe accident. As it was found on examination that there was a dorsal dislocation of the femur, the patient, who was somewhat intoxicated, was placed under an anæsthetic, and an attempt to reduce the displacement was made; but this failed, and further treatment was postponed. Next morning, however, it

transpired that the dislocation had occurred many years before. One other case. A man, thrown in the hunting-field, lay on the ground insensible. A sporting bone-setter, who happened to be at hand, finding the man's neck all awry, jumped off his horse, raised the patient's shoulders, and, placing his knee at the nape of his neck, began pulling at his head to "put his neck in." This energetic usage brought the patient sharply to his senses; and on thus recovering himself and realizing what the bone-setter was doing, he shouted "Born so, born so!" In fact he had had a wryneck all his life. Gentlemen, I sincerely trust these incidents may not seem to you to be related in any spirit of unbefitting levity, or in any sense idly. I use them in the hope that they may impress upon you the very serious importance of being careful that the facts of the case you are about to treat are really as you suppose them to be.

7. *You overlook collateral evidence, e.g., of syphilis, or tuberculosis.*—Thus, in a case of chronic inflammation of the bladder—although you examine other parts fully—you may overlook a small swelling in the globus major of the epididymis, which, had you noticed it, would have strongly suggested that the cystitis was tuberculous.

8. *Diagnosis may be impossible because the disease is unknown.*—Any one who met with a case of Charcot's disease in, let us say, 1865, must have failed to recognise it, for the affection was first described in 1868; while until recently such conditions as syphilitic disease of the joints, osteitis deformans, anthrax, actinomycosis, infantile scurvy and syringomyelia were unknown. At present no

doubt, there are many diseases that are unknown and in regard to which diagnosis is therefore as yet impracticable.

9. *In some cases a correct diagnosis may be too difficult to be attained.*—Thus a child twelve months old, who had previously appeared perfectly well, was, while in its mother's arms, suddenly seized with urgent dyspnoea. It had nothing in its hand just before, and had not been recently fed. The symptoms, however, pointed strongly to a foreign body in the air-passages. Tracheotomy was performed, but, though a little relieved at first, the child died within an hour and three-quarters of the onset of the attack. *Post-mortem* examination showed that as the result of tuberculous disease of the glands situated behind and below the bifurcation of the trachea a small abscess had formed and had ulcerated into the posterior wall of the trachea, and that through the opening thus formed a caseous gland had passed into the trachea, and had completely obstructed the right and partially occluded the left bronchus. This remarkable case is related by Mr. R. W. Parker in the twenty-fourth volume of the *Clinical Society's Transactions*.

10. There are difficulties in obtaining *characteristic or conclusive symptoms* and these you fail to overcome. A patient has, you suspect, stone in the bladder, but although your suspicion is correct, on sounding you do not find it. This may be either because it is lodged behind the prostate, where an ordinary sound cannot be made to strike it, or because it is encysted—for there are such things as encysted stones, although they are rare.

11. *Conclusive symptoms may be absent.*—You will agree with me that the conclusive symptoms of fracture of a bone are deformity, preternatural mobility, and crepitus. Yet there are many fractures in which these symptoms are absent, or inappreciable ; they are often absent in fracture of the clavicle in children, and they may be inappreciable in impacted fracture of the neck of the femur, in fracture of the pelvis, and, of course, in fracture of the skull.*

12. *The same symptoms may be common to two quite different conditions.*—To illustrate this take the case of an enlargement of the head of the tibia, which you believe is either inflammatory or a sarcoma. How will you decide which condition is present ? (a) A history of injury would suggest inflammation ; yet cases have been given above in which sarcoma followed rapidly upon an injury. (b) As to the shape of the enlargement—a fusiform contour, symmetrical and free from lobes, or irregular bulging, would point rather to inflammatory swelling than to a new growth. Yet a new growth may be smooth, fusiform, and symmetrical, and an inflammatory swelling may involve one side of the bone only, and present a quite irregular outline. (c) An inflammatory swelling may be, as to consistence, quite firm ; or, on the other hand, more or less soft, when the superjacent tissues have become infiltrated and are breaking down. In a similar way a periosteal sarcoma may be either firm like bone, or broken down and so elastic that the sense of fluctuation is very closely imitated. (d) As to rate of increase.

* Since this was written the Röntgen process has been introduced, and no prudent surgeon will overlook its use.

An inflammatory swelling may increase either quickly or very slowly ; and precisely the same may be said of new growths—a myeloid sarcoma may grow slowly, a periosteal sarcoma rapidly. (*e*) Enlarged and tortuous veins and a dusky appearance of the surface indicate obstruction to the venous return ; and although they are more common and more pronounced in cases of new growths, yet they are without doubt met with also over inflammatory enlargements. (*f*) Pain may be either well marked or trivial, or even entirely absent, both in inflammatory swellings and in new growths. (*g*) As to the patient's temperature. This in inflammation of the tibia may be quite normal, or it may be considerably raised. And exactly the same is true when the affection is a new growth. In a case of myeloid sarcoma, slowly increasing, the temperature is usually normal ; but I have met with several cases of periosteal sarcoma in which the temperature in the patient's axilla was between 101° and 103° (p. 246). Here, then, are seven symptoms which are common to two such radically different conditions as inflammation and new growth ; and the result of this circumstance has been that the two affections have been frequently mistaken the one for the other and, so, grave errors of treatment have occurred. Such errors can only be avoided by most thorough study of the case from every point of view, and by abstaining from radical treatment until an exploratory operation has been performed.

13. *You attribute the symptoms you observe to one cause, when they are really due to some other.*
—Last year my attention was drawn to a boy of twelve, who three days before had fallen upon his

tuber ischii while he was sliding on some ice. He had complained of severe pain, and the part was somewhat swollen and very tender on pressure. His general condition appeared to be very grave. He had severe headache, and was delirious, his temperature was 103° , his pulse 120, and he looked flushed, heavy, and dull. The boy's high fever, delirium, rapid pulse, &c., made me afraid that he had, as the result of his injury, acute infective periostitis and septicæmia. I do not see how this suspicion could have failed to arise in the mind of any one familiar with that formidable condition. I had chloroform given at once, and I carefully examined the injured part, expecting, I own, to find evidences of mischief that would require a free incision through the periosteum; but I could make out nothing beyond some swelling, such as might follow an ordinary bruise. The tuber ischii seemed quite normal. Boracic fomentations were therefore applied, and we were all interested to see what course the case would take. Well, in two days the boy had perfectly recovered, and then it seemed clear that he had merely had a sharp attack of influenza, an epidemic of which was raging at the time.

A man of twenty-three was some few years ago admitted into the old Lazarus ward with "acute gonorrhœa and orchitis." He had a copious urethral discharge, and there was a swelling in the right side of the scrotum, just as if he had very acute orchitis. The skin was dusky, and the part extremely tender. When I saw the patient an hour later, I was struck with his general appearance and his symptoms. He was pale, and his forehead was

bedewed with beads of perspiration. His pulse was rapid and small, he was sick, and in very great pain and very restless. On further examination I found that his abdominal muscles were rigid, that his abdomen was tympanitic and tender on even slight pressure, and that the swelling in the scrotum was distinctly resonant on light percussion; in short, that the man was suffering not from orchitis, but from acute strangulated hernia, and he was at once submitted to operation.

14. *You forget that the case may be neuromimetic.*—A girl of fourteen was admitted into the hospital presenting all the appearances of old hip disease with loss of movement, and long-standing flexion and adduction—showing themselves in the compensatory postures of lordosis, and apparent shortening. I confess I was completely deceived, as others had been; and I made preparations for the treatment of the case by weight-extension in the long axis of the femur. The girl's position, however, was so bad that I had her placed under ether in the hope that I might be able, without using any force,* to “unfold” the limb and bring it into a somewhat more manageable position to start with. When she was asleep we were much surprised to find that the limb had passed into a normal position, and was perfectly movable in every direction. As soon, however, as she recovered consciousness, the full amount of previous distortion and of muscular rigidity forthwith returned. This girl ultimately recovered perfectly under massage and Sister Stanley's judicious management.

* “Diseases of the Joints and Spine,” 1895.

All are familiar with these neuromimetic cases of joints, spines, talipes, &c. Yet you will not find it easy in dealing with them to avoid mistakes and oversights which may have a tragic effect on your reputation in the early years of practice, especially if you have a bone-setter in the neighbourhood.

15. *You forget that your patient may be shamming.*
—Many of you will recall the case of a young woman lately in one of the wards who had a strange-looking œdema of her upper extremity. I was asked by Mr. Gay, of Putney, to take her in, so that, if possible, we might bring her to the mind of discontinuing the trick of producing this œdema by tying something tightly round the upper part of the limb. When she found that the dressers, sister, and nurses all knew that she produced the swelling herself, she discontinued the trick, and she was discharged with the limb in a normal condition. Three or four months afterwards, however, she came, looking the picture of innocence, with the arm again swollen, and with several sores on the forearm, which there could be no reasonable doubt, she had herself produced. Some of you will also remember that in the course of the summer Mr. Willett showed, at one of the Thursday consultations, a young woman who had a very extraordinary condition of her left lower limb. The limb was in a state of tense œdema nearly up to the groin. Her opposite limb had been amputated for elephantiasis some years previously, and she now wished this limb also to be removed. On investigation it was conclusively proved that she produced the œdema by tying something round the top of her thigh. The remarkable point

about this case was that the patient came into the hospital for the express and declared purpose of having the limb amputated. A girl of fourteen had an odd-looking ulcer on the back of her hand. Was it lupus, or an aggravated chilblain, or what? We found out that she produced and maintained it by constantly picking it and irritating it in various ways. We put her hand on a splint, and covered the ulcer with a shield which she could not remove. The ulcer healed. We twice discontinued the splint and shield, and the ulcer on both occasions returned; but it soon healed when they were reapplied. Dr. Savage told me lately of a young lady whose mother was horrified by an extensive sore on her wrist. The girl made light of it, and seemed—in order to save her mother's feelings—to bear the distressing condition with great fortitude. Dr. Savage, however, found that the sore was her own production. He saw her, when she thought she was not observed, tear off the strapping and lacerate the granulations till they dripped with blood, and all this without betraying herself by even a look of discomfort.

Many other cases of shamming could be mentioned; but I will here refer to only one, that I have lately seen. A girl of eleven was said to have a very strange condition of her fingers, consisting of free perspiration around the roots of the nails, with the further peculiarity that the exuded fluid was mixed with a large number of fine air-bubbles. In a few days her parents were distressed to find that a similar condition involved many of the toes. The wonder still grew, and it was noticed that oozing had begun also at the umbilicus, which was occupied

by a frothy fluid. It was very early strongly suspected that the appearances were produced by the child herself—by some trick, and on examination the fluid was ascertained to be saliva; in fact, she had been spitting into her finger and toe nails, and into her umbilicus. Her feet, therefore, were enclosed in splints, and covered up so that her plans thus far were defeated; but when the coverings a day or two later were removed, the deeper layers were found quite wet and soaking, and the fluid turned out to be urine which she had dribbled in between her skin and the splints.

The subject of shamming is one of much clinical importance, and one that will call for all the sharpness, discrimination, and judicial temper you may possess. Some impostors have had so much practice, and have learnt so much about the symptoms of the complaint they pretend to be suffering from, that they are very likely to deceive you. When I was house surgeon a woman on one or two occasions obtained admission into the medical wards by shamming intestinal obstruction. She said she had severe pain and abdominal tenderness, and declared she had been very sick, and on examination it was found that her abdomen was tensely distended and tympanitic. When her fraud was detected she made a full confession—and then departed, no doubt, “to fresh woods and pastures new.” On the other hand, you may believe a patient is shamming when in reality he is suffering from some serious illness, or the results of a serious accident. Many years ago a house surgeon felt convinced that a highly loquacious and picturesque Irishman who had fallen down was

not really hurt, but was shamming in order that he might be taken into the hospital. He therefore made him get out of bed and attempt to walk. After a couple of steps, however, the man gave a sudden cry of pain, and would have fallen had he not been supported. He was then found to have all the symptoms of an extra-capsular fracture of the neck of the femur, which, until he was made to throw his weight upon the limb, had been firmly impacted. In cases in which you suspect shamming it is advisable not to say anything to wound the patient's feelings, and not to use any test that may possibly do harm, for your suspicion may be completely unfounded.

Much more might be added under the title of this lecture, but I hope I have said enough to induce you to study the principles of diagnosis very carefully for yourselves.

ON INJURIES TO JOINTS,

WITH SPECIAL REFERENCE TO THEIR IMMEDIATE AND REMOTE TREATMENT BY MASSAGE AND MOVEMENT.

BOTH massage and exercises have long been known and employed in English surgery, but they have lately come into much more general use. Both, undoubtedly, are valuable remedies, and are often required ; but, if employed by rule of thumb, or as a matter of routine, and before a careful diagnosis has been made, they may do great harm. They are both forms of surgical treatment, and as such they should be employed only under adequate surgical supervision in respect to the skill and experience of those to whom they are entrusted, the duration of each sitting, the effect they are producing, and the assurance that the case in hand is undergoing no change which should interdict their continuance.

When these precautions are neglected pain may be rendered severe and persistent, muscles may become irritable and spasmodic, or jaded and weak, sometimes considerably wasted, joints may become painful and over-sensitive, or there may be considerable synovial effusion. In one case a sharp attack of gout, following massage of the knee, was overlooked for some days ; massage was continued to order, and the pain the patient suffered can readily be imagined.

In several cases overlooked joint tuberculosis has been rendered more active. In one instance massage and exercises were used for nine weeks in a case of overlooked rupture of the tendo Achillis. In another a patient was handed over to a masseuse for the treatment of a hysterical knee. After massage had been persevered in for six weeks some swelling was observed about the internal condyle of the femur, which proved to be due to sarcoma, for which the limb was amputated a few days later. It must be remembered that such occurrences can be avoided only if the surgeon keeps a close eye on what is going on.

Physiology of Massage.—It is necessary to have clear ideas as to what has been termed the “physiology of massage”—as to the different ways, that is, in which it acts on the structures to which it is applied.

1. It enlarges the amount of blood circulating through the part concerned. This is obviously apparent in the skin, which, instead of remaining cold and pale, becomes warm and more or less red. The same result was experimentally demonstrated in regard to the muscles by Brunton and Tunnicliffe, who showed that the amount of blood passing through them, both during massage and after its cessation, was increased. This increase of blood is in every way advantageous. It maintains or improves the nutrition of all the various tissues; it promotes the restoration of the functional activity of injured muscles, and it plays an important part in the absorption of lymph and extravasated blood.

2. Its action is mechanical. By kneading and per-

cussion extravasated blood and lymph which have been coagulated in the tissues, and have led to brawny œdema, are broken up and dislodged, while by stroking from below upwards they are swept onwards, and brought within the reach of healthy lymphatics and a normal venous circulation, so that they can be more readily absorbed.

3. It is an efficient stimulant to damaged muscles through its influence on the nervous system. In such minor injuries as sprains and contusions, the small nerves ramifying in the injured part are probably seldom torn across, for they are tough rather than brittle, they are well protected in the subcutaneous tissue and the deeper structures, and their course is tortuous so that they are not easily put on the stretch. Nevertheless they are not infrequently so far injured that their functions, for the time being, are more or less suspended, and massage is then a very useful agent in their restoration. It probably acts in a similar manner on the vaso-motor nerves which preside over the arterial system of the part.

4. No one who has watched its sedative effect when applied in cases of recent injury, can doubt the influence of massage in reducing muscular spasm and relieving pain. In such instances it must be used very gently, and be limited to stroking and light friction, for short periods three or four times a day.

5. Probably massage promotes the absorption of recently formed adhesions, provided they are not too extensive and firm. This is a matter of considerable interest. Just as provisional callus, formed in the repair of fractures, is absorbed, so is much of the new

connective tissue which is developed after injury of the soft parts. Perhaps the most obvious instance of this is met with in the case of adhesions following peritonitis. Even extensive adhesions gradually, yet completely, disappear, probably as the result of constant disturbance and traction during peristalsis. Much the same result is produced by what may be termed the interstitial disturbance and traction which take place during the different movements employed in massage.

As to *movements*, it is necessary to allude to the sense in which this term is used. Three forms of movements present themselves for notice—movements of joints under an anæsthetic, passive movements, and movements performed by the patient, often against resistance, that is, when the patient, for instance, tries to flex his knee, while the masseur, with appropriate force, resists his doing so.

As to movements under an anæsthetic, they can be safely applied only after a very careful diagnosis has been made. If he uses them haphazard, a surgeon may do as much harm as a bonesetter. It must be remembered that their direct influence for good upon the joints themselves is comparatively limited. They break down slight synovial adhesions, reduce displaced semilunar cartilages, and alter the angle at which a joint has become fixed. If these good results are to be obtained, however, the joints concerned must be practically healthy. In joints which have, as a result of disease such as tuberculosis, gout, or septicæmia, or such degenerative conditions as Charcot's disease, or some forms of osteo-arthritis, undergone material structural changes, forcible move-

ments are, as a very general rule, inappropriate or mischievous. The cases in which forcible movements are able to effect very important and striking results are those in which a joint—for instance, the shoulder—which is in itself structurally normal, is hampered by adhesions in the parts around. It is a fact, which is often overlooked in practice, that it is useless and mischievous to employ forcible movements to diseased joints, except to remove or diminish deformity, and that therefore accurate diagnosis must invariably precede their use. Recalling cases in which forcible movements have failed, I should say not that the general estimate of their true value in appropriate cases is an exaggerated one, but that their results are often disappointing, or even positively unfavourable, because they are used with too little discrimination.

Passive movements are useful after adhesions have been broken down, or in removing or preventing stiffness of healthy joints which are temporarily disused—for instance, in cases of fracture of a limb or disease of one of the other joints.

Voluntary movements, especially when performed against resistance, and assisted by appropriate apparatus, are very valuable in combination with massage—often, indeed, they are of much more value than massage itself, for as forms of vital activity they are the best agents in promoting nutrition and in restoring normal function. All this is well known in the treatment of scoliosis.

Diagnosis.—Diagnosis is of very essential importance. Exact diagnosis is often not to be

attained, but in every instance before massage and exercises are employed diagnosis must at least be carried far enough to indicate (*a*) that the case belongs to the general class in which these agents are useful; (*b*) that no element is present in the case which renders them unsuitable.

The chief conditions for which massage and exercises are suitable are the following :

Sprains and contusions of previously healthy joints, unattended with any material complication—in which, that is, there is no dislocation or even subluxation, no fracture, no displacement of tendons, and no pre-existent affection, such especially as tubercle or gout, or hæmophilia. Care must be taken, needless to say, not to overlook Colles' fracture of the radius, or Pott's fracture at the ankle. It must not be forgotten that the symptoms produced by some fractures may be so slight that the nature of the injury is easily overlooked. I have known a patient walk nearly half a mile, although he had a recent fracture of his patella. Impacted fracture of the neck of the femur, as a fracture that may be overlooked, is an example with which all are familiar.

The surgeon must therefore repeat his examination when swelling has subsided, and if possible procure a skiagram in any doubtful case, yet always remembering that these shadow-pictures may be deceptive and therefore must be used with discretion. The importance of going over the ground again—that is, of revising the diagnosis originally made—cannot be exaggerated. In sprains of the knee, again, one of the semilunar cartilages may be displaced and require

immediate reduction. I have met with instances in which one of these cartilages remained displaced and unnoticed for upwards of six weeks, though it was readily reduced when the joint was manipulated under an anæsthetic, an operation which at once relieved the patient of all his symptoms. Subluxation of the bones of the wrist and of the tarsus is undoubtedly rare, yet it may be present. I have seen it at the mediotarsal joint in the foot and between the scaphoid and the internal cuneiform bone as well as in the bones of the carpus.

Muscles may be ruptured or their tendons ruptured or displaced as part of injuries which are loosely spoken of as sprains. The tendo Achillis may be ruptured, part of the quadriceps extensor cruris may be torn where it is muscular, or its tendon may be ruptured close to, or an inch or more above, the patella, or the abductor longus an inch or two below its origin from the os pubis (*see* p. 150). Tendons may undoubtedly be displaced—for instance, the peroneus longus or the long tendon of the biceps, yet my own experience would lead me to believe that displacement of tendons is much less often met with than is generally supposed. Bonesetters tell their patients that a tendon is out of its groove, or that “the deltoid has slipped round to the front ;” but, setting this jargon aside, displacement of tendons is distinctly a rare occurrence.*

The after-treatment of recent dislocations has undergone a radical and highly advantageous change in the last twenty years. Formerly, after a dislocation of the shoulder had been reduced, the arm was

* Vide p. 127 *et seq.*

bandaged to the side for three weeks. Nothing could well have been worse treatment. At present after reduction the arm is kept in a sling for a day or two, until pain has subsided. Then daily passive movements, gradually increasing in range, are employed, together with massage. I have seen a patient treated thus who three weeks after the original accident was able to move his arm in every direction to the full normal range, and who felt no ill-effects of the injury beyond some muscular weakness of the limb. I have also seen a patient three weeks after the reduction of a dislocation at the hip walk without a trace of lameness, though the limb felt weak and he was unable to run.

As to the remote treatment of injuries of the joints—that is, the treatment of injuries of some standing. In such cases—as in recent injuries—before any treatment is decided on, it is necessary to make as accurate a diagnosis as possible. It must be remembered that the great majority of simple injuries of the joints of moderate severity—those, namely, in which there is no fracture or dislocation, no extensive laceration of important structures, and no diathetic condition, such as tuberculosis or gout—tend to speedy, or more gradual recovery, so that the mere fact that recovery from what at the time appeared a simple strain or wrench has not taken place, makes it essential to find out by what condition recovery has been prevented. In a large number of cases adhesions are formed; these limit movement, and cause pain, as in the cases mentioned above. When once the surgeon can convince him-

self that this is the nature of the case before him, he has, in movement under an anæsthetic, massage and passive, and later, active movements against resistance, to which hot douching may be added, efficient means of treatment which will soon lead to recovery. These are some of the most satisfactory cases in the whole range of minor surgery ; but in many instances of delayed recovery after injuries of the joints, other conditions, either local or general, put, so to say, another complexion on the case, and render mere movement and massage insufficient or even definitely wrong.

Tuberculosis may follow an ordinary sprain. Thus a boy of ten or fifteen falls and wrenches his elbow; the joint, at first stiff, painful, and swollen, remains for five or six weeks still stiff and a little enlarged, while it is now also noticed that the muscles are wasting and that the surface is a little over-warm. Here tuberculosis has probably followed (and it may do this very quickly) on an injury ; or, in older people, osteo-arthritis may follow an injury, especially in the shoulder or the hip, or there may be a substratum of gout. There are also two other conditions to be mentioned ; both are rare—even, it may be said, very rare ; yet both must be kept in mind unless grave mistakes are sometimes to be made—I mean malignant disease and hæmophilia. Cases, though very rare, are yet occasionally seen in which sarcoma is detected a few weeks after a wrench of a knee or an elbow. Whether, or in what manner, this is really cause and effect I do not know, and mere speculation here would be out of place. Often, no doubt, it is a mere coincidence, the growth having

been in progress, although unnoticed, before the injury took place; but the main point is that the possibility of the supervention of a growth after an injury should not be forgotten.

I have seen two cases in which prolonged stiffness and swelling, which really depended on hæmorrhage due to hæmophilia, were attributed to tuberculous disease (*see p. 273 et seq.*).

These observations, which could easily be extended, will suffice to show that in every case alike critical diagnosis must precede active treatment. It is only thus that a clear line can be drawn between bonesetters, who move everything, and the surgeon, who acts with what, I hope without arrogance, may be termed scientific discrimination. When complications of the kind I have briefly alluded to can be excluded, when, that is, the conditions which retard or prevent recovery consist of adhesions, feeble circulation, chronic lymphatic obstruction, torpid muscular action, or the fears or neurotic behaviour of the patient, movement and massage are not only useful, but they are by far the most efficient means of treatment at present known.

But to be successful massage and movements must be thoroughly carried out. It is, in many cases, futile to suppose that a single movement under an anæsthetic of a disabled shoulder or knee will suffice. The original movement must be followed, starting the next day, by passive and active movements and massage employed every day, care and good judgment being used in determining the proper limit as to the time for each sitting, and all other details.

Some surgeons I have noticed, having determined upon a course of massage and movement, prescribe the treatment four times a week. To be useful, however, it must usually be employed regularly for a fortnight or three weeks once every day.

The chief symptoms which suggest the movement of a joint under an anæsthetic are stiffness and pain. Yet, before movement is employed, the cause on which these symptoms depend in any particular case must be very carefully estimated. It must be ascertained whether they are due to conditions (*a*) in, or (*b*) around the joint, and for this purpose a very critical examination may be necessary. Take the shoulder: The movements of the arm may be almost entirely lost, there may be muscular wasting, and the patient may complain of severe pain, worse at night, and increased if he tries to lie on the affected side. Is this a case of disease of the joint itself or of adhesions outside? I believe there is only one test which can be relied on to settle this question. The surgeon must ascertain whether the joint is as stiff as it, at first sight, appears to be; or whether it is only wide movements that are restricted or lost, while movements within a limited range are still present. In a shoulder which at first seems quite stiff, it may be found that within a limited range the humerus rotates, of course under gentle manipulation, with absolute freedom and smoothness in the glenoid cavity, and that the elbow can be moved forwards and backwards, within a limited range, as freely as in a sound limb. If these smooth and normal movements—limited though they be—are present, the fact is a very strong indication that

the trouble is not within the joint but in the parts around.

As to pain: It is very important to bear in mind that, taken alone, pain affords no reliable evidence as to whether the trouble is inside or around the joint, for, on the one hand, the pain produced by many joint diseases is slight, while, on the other hand, the pain produced by adhesions outside a joint which is itself perfectly healthy, may be so severe that at night the patient can get but little sleep; while if the limb is suddenly moved pain is increased to agony. In shoulder cases pain may be still further deceptive, because, although it depends entirely on external adhesions, it is referred to the middle of the arm (at the insertion of the deltoid) just as it is when the joint itself is diseased.

One word on muscular wasting. This is always an important symptom. Of course, it is invariably present when a joint itself is involved, and it is proportionate to the severity of the disease, that is, in early and slight disease it is but little marked, while in severe or advanced disease it grows much more considerable. Yet in cases of mere adhesions—the joint being perfectly healthy—wasting, though never extreme, is often very well marked. It is in presence of the facts that (*a*) adhesions around a perfectly healthy joint may be attended with very severe pain, and (*b*) with muscular wasting, which may be very obvious, that the test I have mentioned as to the existence of perfectly free and smooth movements, within a limited range, becomes of the utmost importance. A lady, aged fifty-four, who had severe pain in her shoulder, was unable to move her arm, and

had marked wasting of the deltoid and the scapular muscles, was told that she had osteo-arthritis of the joint. On using the test just described, however, it was found that within a limited range movements were perfectly smooth and free. The joint was moved under an anæsthetic, numerous adhesions gave way, and with passive movements and massage complete recovery followed.

Sometimes a patient complains that his ankle or some other joint, after a slight injury, remains painful on exercise, and a little stiff, and even slightly swollen. On examination, however, nothing definite can be made out. In these cases if on very careful investigation such conditions as tuberculosis, rheumatism, gout, &c., which would contra-indicate forcible movement, can be excluded, the joint should be moved under an anæsthetic; for these symptoms may very likely depend on a slight adhesion, and when this is broken down they will at once disappear.

Some years ago, on two or three occasions, I found that cases which there seemed no reason to suppose would be benefited by manipulation were cured by bonesetters. Since that time I have often taken the course I have mentioned above, and on moving the joints under gas have found—sometimes being conscious that a slight adhesion had given way, sometimes noticing nothing—that the symptoms forthwith disappeared. The following was a good example: A man who had wrenched his ankle three months before, came to the hospital because the joint remained stiff, swollen, and painful. Adhesions were broken down under gas, and he went out a day or two later, free from pain and able to walk. A year

later, having been in the interval quite sound, he returned saying that his old symptoms had recently returned, and that he was again lame and in pain. I found movement apparently free, and, seeing no reason for manipulating the joint, advised him to rest it for a few days and offered him a liniment. He urgently begged me to "do what cured him before." I then gave him gas and moved the joint. I was not conscious that any adhesion gave way, but he said on recovering that he could now walk freely. I have seen him since and he has remained quite well. Such cases are a trap. The adhesions are so slight that they produce no objective symptoms, and there may appear no reason for using movement. But the bonesetter, who always finds that a little bone is out or that a tendon has slipped, and who manipulates everything, manipulates these cases with the rest, and cures them to the lasting gratification of the patient and the equally enduring surprise and chagrin of the surgeon who has been found off his guard.

THE PRESENT USES OF EXCISION OF THE KNEE-JOINT.

It would probably be difficult to find a better illustration of evolution in surgery than that which is afforded by the history of excision of the knee-joint.

Originally performed by Parke in 1781, and repeated only occasionally in the next seventy years, the operation was revived by Fergusson in the year 1850. Although Fergusson's first case was fatal from septicæmia, he soon afterwards repeated the operation with success, and so many surgeons of that day also practised it that in the course of the next seven years upwards of one hundred instances were recorded, and, to quote Fergusson's own words, "it was clearly shown that the results of the operation were less hazardous and more satisfactory than after amputation of the thigh." He advocated it strongly as a substitute for amputation, and dwelt on the advantage to the patient of retaining a limb of flesh and blood instead of having to depend on an artificial support. He soon had the satisfaction of seeing the proceeding take rank as one of the great operations of surgery and of witnessing a steady improvement in the results by which it was attended. In all the earlier cases—indeed, down to about the year 1870—the operation was performed for such advanced cases of

disease (chiefly tuberculous) that the choice of treatment lay between excision and amputation. About this date the first epoch in the evolution of the operation came to an end and it was followed by the second, which lasted, approximately, for the next fifteen years. At the commencement of this second period—in the years, that is to say, between 1870 and 1875—with the introduction of the aseptic method the conditions under which the operation could be performed were completely changed. It could now be practised with scarcely any appreciable risk of septicæmia, primary healing of the wound could be securely reckoned upon, and the patients were able to use the limb in the course of two or three months. The important bearing of these facts was at once recognised. As the operation was practically safe, and was followed by such rapid repair, it was seen to be a proceeding which might be adopted, within certain age limits, in any case in which, on other grounds, it was advisable to resort to it. Such a condition appeared to some surgeons to present itself in the early stage of tuberculous disease as it is so commonly met with in childhood. Koch had recently shown that tuberculosis was an infective process depending on the presence in the tissues of a micro-organism, and it was now proposed to eradicate the disease by removing *en bloc* the structures which had become involved in it. Experience, however, soon showed that although, as a mere operation, excision was highly successful, it was yet attended with two fundamental drawbacks—the one anatomical and the other clinical. The former consisted in the fact that in many instances the tuberculous process originated

in the end of the diaphysis of either the femur or the tibia, the removal of which would not only at the time materially shorten the limb, but would involve the sacrifice of the particular part of the bone in which subsequent growth in length should have taken place. Excision of structures such as these, which are essential to the usefulness of the limb, was plainly inadmissible; while from a clinical point of view it was observed that, even though only a limited amount of bone had been removed, the line of union of the bones was prone to yield so that flexion or some other deformity followed, and the usefulness of the limb was destroyed or seriously impaired. Thus the ultimate results of excision of the knee in childhood were so unfavourable that by common consent the operation was abandoned except when deformity which could not be otherwise corrected had taken place. When this result had been reached—roughly speaking, between the years 1880 and 1885—the second stage of evolution came to its close. At this period it seemed probable that the uses of excision of the knee had become very much narrowed, and that the proceeding would in the future be resorted to in only a very limited number of instances. Further clinical experience, however, has led to the recognition of several conditions for which excision of the knee is admirably adapted, and in which it yields results which must secure for it a permanent place amongst the best operations in surgery.

The cases in which excision, with few exceptions, is advisable are limited to adults and adolescents in whom the growth of the limb is, or is nearly, complete and the bones have acquired so firm a texture

that after the operation they readily unite by an unyielding synostosis. Such cases may be arranged in the following groups :

GROUP I.—Those cases in which the joint has become ankylosed in a bad position. The majority of such cases are tuberculous, but others are the result of septicæmia occurring in a variety of circumstances, of gonorrhœal arthritis, of the form of disease placed below in Group III., of some forms of osteo-arthritis, &c. In all these instances the operation is resorted to for the single purpose of removing deformity.

GROUP II.—Those cases in which the joint is incapacitated by incomplete fibrous ankylosis resulting usually either from tuberculosis or septicæmia. The tuberculous cases are those in which, by chronic inflammation, extending it may be over several years, the synovial membrane, ligaments, and cartilages have been destroyed and replaced by fibrous adhesions which limit, but do not entirely prevent, movement. Under these circumstances the joint remains irritable and painful when the adhesions are stretched by exercise, and the patient thus is prevented from following any active employment. In other cases the disease has commenced in the articular end either of the femur or the tibia, and has resulted in the formation of a circumscribed deposit of tubercle in the immediate vicinity of the joint, upon which it acts as a constant irritant. In other cases, again, the joint has been destroyed by quiet, slowly advancing tuberculosis. In the septicæmic cases, as in the tuberculous group first mentioned, the condition present is that of incomplete fibrous

ankylosis leading on exercise to irritability and pain.

GROUP III.—Another group of cases in which excision may be required is that in which, by a process regarding which very little is at present known, a variable number of the joints, one after another, become inflamed, slightly over-warm, and somewhat painful, and then, in the course of a few months, fixed by a complete bony ankylosis in (as will be the case unless it has been prevented by the careful use of splints) a position of flexion. In some instances so many joints are involved that to correct the position of the knees only would be futile, but when the knees are the only joints concerned in the lower extremities, rectification of position by excision may enable the patient to be to some extent active.

GROUP IV.—When, as the result of osteo-arthritis, the knee-joint has undergone extensive structural change there are—though they are rare in practice—one or two conditions in which excision may be performed alike with safety and great advantage to the patient: first when the ligaments have become weakened and relaxed, so that the joint is reduced to a loose, almost flail-like condition, and, secondly, when the joint has become fixed at such an angle of flexion that the limb is useless. Of course, in many cases there are circumstances, such as advanced age, a defective condition of the general health, or similar disease of other large joints, which would contra-indicate the operation. But when these are absent the operation may sometimes be performed with great advantage. It seems advisable to point

out that whereas formerly such an operation as excision of the knee for osteo-arthritis would have involved very grave danger, at the present day and under the protection of asepsis the proceeding in carefully selected cases is generally followed by uninterrupted recovery.

The following cases will serve to illustrate the different groups mentioned above in which excision is advisable.

As to the first group, however, in which the operation is performed in adults for the removal of the deformity, the proceeding is so familiar to every surgeon that no further reference need be made to it except to say that there are few surgical operations which can be more confidently recommended or in which more satisfactory results are obtained. The following cases will illustrate the second group :

CASE I. *Incomplete Fibrous Ankylosis following Tuberculous Synovitis; Excision.*—A man, aged twenty-five years, came to St. Bartholomew's Hospital with a history of disease of his right knee, evidently tuberculous, which commenced when he was eighteen years old. The disease had never been acute, but the joint had gradually become more and more stiff and painful when he walked upon it. For two years he had done no work. On his admission to the hospital the joint was found to be quite free from deformity and in a position of extension. Swelling was so slight and the appearance of the joint was so natural that at first it appeared unlikely that any serious disease was present. The patella was partially fixed on the condyles of the femur, and passive movement could be carried out through a range of about 10°

of flexion, when, however, it was suddenly arrested. This movement produced no pain. During the time that had elapsed since the disease first appeared the joint had been kept very much at rest, and for six months the patient had constantly worn a leather splint, but without material improvement. Excision was advised, and at the time of the operation it was found that the articular cartilages had almost completely disappeared and that the ends of the bones were connected by strong short-fibred adhesions.

The condition of the joint in this case was exactly comparable to that of the lung in fibroid phthisis. There were the same evidences of chronic irritation and the same inflammatory thickening and formation of firm cicatricial tissue. The similarity in the changes observed in such a joint and in fibroid phthisis may usefully be borne in mind. Indeed it might conduce to a clear view of this state of a joint were we to think of it as fibroid phthisis, for in the joint and the lung there is, on the one hand, the slow yet persistent advance of the tuberculous process by which the normal structures are gradually destroyed, and, on the other, there is as constant and tenacious an effort on the part of the tissues to resist invasion and accomplish repair.

CASE II. *Deposit in the Lower End of the Femur of a large Mass of Tubercle which had undergone Caseation, and the Presence of which had rendered the Joint practically useless for Two Years.*—A man, aged twenty-four years, came for advice about his knee, which had, he said, been weak, and at times painful for three years, and upon which he had been unable to walk for nearly two years. On repeated examina-

tion, nothing could be detected that was abnormal except some limitation of movement and marked muscular wasting. The limb was fully extended, there was scarcely any swelling or synovial thickening, and there was no local tenderness anywhere, and no heat. The patient, however, stated that though he felt no inconvenience and saw nothing amiss when the knee was kept at rest, yet that always as soon as he tried to use the limb the joint became swollen, hot, painful, and stiff. It was difficult to say exactly on what these symptoms depended. The joint itself evidently was not primarily diseased, but there was some condition in its immediate neighbourhood which from time to time, and always after exercise, led to a transitory synovitis. On the whole the most probable view seemed to be that there was limited disease in the end either of the femur, or of the tibia most likely, seeing that the condition was of long standing, tuberculous in its origin. But at all events, it was advisable to submit the case to an exploratory operation. On opening the joint the synovial membrane, the ligaments, and the cartilages were all practically normal, though in some parts the synovial membrane was indurated and opaque as if it had often been slightly inflamed. But at one spot near its external border the cartilage covering the internal condyle of the femur had lost its glistening appearance and was of a dull yellow colour. On closer examination this was found undermined and the bone beneath softened. On removing the cartilage, a mass of caseous tubercle, as large as a bantam's egg, was discovered and removed. This left the condyle

little more than a shell. Two similar but smaller tuberculous masses were scraped out from the cancellous tissue of the external condyle. As the articular surface of the femur had thus been extensively interfered with so that a movable joint could scarcely be hoped for, it seemed best to perform excision. The patient made a good recovery and in three months was walking on the limb.

CASE III. *Chronic Tuberculosis of the Knee leading to quiet yet complete Disorganisation of the Joint.*—This case is a typical example of a group of cases which are by no means rare but which are not unlikely to be misunderstood in practice. A woman, aged twenty-seven years, had been suffering from disease of the knee since she was sixteen years of age. There had never been much pain or any considerable swelling, and until the year 1895 she had been at times able to walk short distances, but for the last three years the limb had been useless. On examination the joint presented no evidence of material disease except that it was almost fixed. The position was that of complete extension and there was no displacement of the tibia backwards. There was only a very limited amount of swelling and synovial thickening. The muscles of the thigh, however, were a great deal wasted. Thus it might be said of this joint, as of that described in Case I., that its condition did not appear bad enough to require excision. Yet in the light of other cases it seemed useless to wait. On performing the operation it was found that the joint was a complete wreck. Scarcely a vestige of articular cartilage remained anywhere to be seen, and the ends of both bones were in many places ulcerated

and occupied to a depth of half an inch by caseous material. The ligaments and the synovial membrane had been replaced by granulation tissue. Fibrous ankylosis had occurred in some situations, but in others no attempt at repair had taken place.

I would draw particular attention to the example of tuberculous joint disease just given. In its common form tuberculous disease is characterised by the usual symptoms of chronic inflammation: swelling from infiltration of the synovial membrane and sub-synovial tissue, often combined with effusion into the joint, is well-marked; muscular spasm producing flexion, and, later, displacement of the tibia backwards and outwards, so that permanent deformity occurs, is developed; and, when the cartilages have been removed and the denuded ends of the bones are brought into firm contact by muscular contraction, severe pain is produced. In such cases as that just related, the tuberculous process, though it is tenacious and progressive, has none of the symptoms of inflammation. The tissues appear scarcely to react at all, but are gradually invaded and destroyed, so that they and the tuberculous growth seem to be involved in a common process of decay, such as is often met with in chronic tuberculosis of a lymphatic gland. In such circumstances the external evidences of the disease are very slight and afford no reliable indication as to the stage which the morbid process has reached, so that while appearances suggest that the joint is not the seat of serious disease, as a matter of fact it may have undergone complete disorganisation.

Septicæmia.—In cases of septicæmia after parturition, the more severe forms of gonorrhœal arthritis,

acute infective osteo-myelitis, suppurating compound fractures involving the joint, &c., the knee may completely recover, but not infrequently it is left in a condition of fibrous ankylosis. Sometimes this fibrous ankylosis is gradually converted into bony ankylosis by ossification of the new tissue, but more commonly the fibrous ankylosis remains permanent. It may be complete so that the joint is immovable, and then, provided a good position has been maintained, the limb is strong and useful. But frequently after septicæmic infection the knee is left only partially ankylosed by fibrous tissue, so that it moves through an angle of from three or four to twenty or thirty degrees and often it is in a flexed position and cannot be extended. After the original attack the joint remains for many months thickened, over-warm, and irritable. Later, when inflammation has subsided and swelling and heat have disappeared, the patient is still unable to use the limb, for when he tries to do so swelling and pain at once return. A joint such as this will remain month after month in the same condition. Nor can the limb be straightened; the adhesions are at the same time too strong and too irritable to allow of this. Here some form of radical treatment is necessary and excision will be in every way satisfactory. As there is usually no displacement of the ends of the bones, and, as these are healthy, only so much of their substance need be removed as will leave flat surfaces for apposition, firm synostosis will readily occur and the amount of shortening is scarcely appreciable.

CASE IV. *Fibrous Ankylosis of the Knee following Septicæmia after Parturition; the Limb in a*

good position, but the Joint, Seven Months after the Attack, still Over-warm and so Irritable that the Patient could not use it; Excision.—A woman, aged thirty-two years, was admitted in St. Bartholomew's Hospital for the treatment of an affection of her right knee. She stated that her confinement, seven months before, was followed by severe illness, with high fever extending over six weeks, and accompanied by painful swelling of many of her joints. All the joints originally involved, except her right knee, recovered, and she regained good general health. The knee had remained slightly swollen, over-warm, and limited as to movement. It could be flexed from its habitual angle of 120° to nearly a right angle, but it could not be fully extended either by a weight and pulley continued for a month, or when she was placed under ether and tentative manipulation was employed. On any active interference the joint became hot and painful. Excision was advised, and during the operation it was found that there were so many and such short fibred and strong adhesions at the back part of the joint that extension could not have been obtained without the employment of a good deal of violence. In the anterior portion of the joint the articular cartilages had been to a great extent absorbed and replaced by cicatricial tissue. Thus the joint was practically destroyed and could not have been restored to a useful condition.

CASE V. *Septicæmic Infection of the Knee-joint; Persistent Inflammation of Five Months' Duration, attended with bulky Thickening of the Synovial Membrane and Surrounding Soft Structures, Heat, and Severe Pain on any Attempt to use the Limb; Excision.*

—A woman, aged twenty-nine years, had septicæmia after parturition. Several joints were involved, but all recovered except the left knee, which, when first attacked, was swollen, hot, and extremely painful. It was placed on a back splint which kept it fully extended. The conditions of the joint remained very much the same in spite of rest, a succession of blisters, strapping with mercurial ointment, and elastic compression by means of a Martin's bandage applied over a layer of cotton-wool. Five months later the patient was still confined to bed and no improvement was to be noticed. Feeling sure that the joint was obliterated by plastic inflammation and that not for many months, if at all, would the limb bear any exercise, I advised excision. The joint was at the time of the operation found converted into a large cicatrix of newly formed and still vascular fibrous tissue which allowed movement through a range of about five degrees.

So far as I have seen—and a considerable number of cases have been under observation—knee-joints which after septicæmia are in the condition noticed in the two instances just related, are not amenable to any form of treatment short of excision. Rest, blistering, pressure, douching, and massage seldom do any material good, and whenever I have seen it tried forcible movement under an anæsthetic has failed, while in the majority it has left the joint in a much worse condition than before—more swollen and “gummy,” hotter, and very much more painful. In not a few cases three months have been required for the subsidence of the mischief done. Nor can this be any matter for surprise, for what is likely to be gained by the laceration of a massive scar? A further

objection to forcible movement in these instances is that often it does not rupture the adhesions themselves. It tears the adhesions off the bones, together with more or less of the articular surface of the femur or the tibia—a result by which the condition of the parts is considerably aggravated. No doubt in a small proportion of cases a close fibrous ankylosis may become gradually converted into a bony ankylosis, and when this takes place and when the limb is in a good position excision is not called for. Such favourable results are, however, rare. In many cases even should sound bony ankylosis occur it would be unavailing because the limb—as the result of the original attack—has become flexed. Again, bony ankylosis occurs so slowly that while excision ensures an equally good result it has the advantage of saving a large expenditure of time. Thus on all these grounds excision is well adapted for the treatment of joints that have been damaged in the manner which I have described by septicæmic infection.

The following case illustrates the third group :

CASE VI.—*Multiple Ankylosis involving several Joints and following Chronic Changes of uncertain Origin.*—A man, aged twenty-nine years, was admitted into St. Bartholomew's Hospital with all the large joints of the lower extremities apparently ankylosed, the hip-joints and knee-joints being considerably flexed and the ankle-joints extended (equinus). He stated that he had been left in this condition three years before, after an illness attended with fever of thirteen weeks' duration. As to the nature of this illness no trustworthy information could be obtained, but apparently there had been no gonorrhœa. The

patient, who had been ever since confined to bed, was much wasted and in feeble general health. In the course of treatment, with the object of straightening the lower extremities so that possibly he might be able to use crutches, osteotomy was performed on the right ankle and on the femur below the trochanters, and the knee was excised. The bones united firmly in good position, but shortly afterwards the patient's general health broke down and he died from exhaustion two months later.

The subjoined case is an example of the fourth group :

CASE 7.—*Osteo-arthritis ; great Deformity of the Hands ; Affection of the Right Knee which had become flexed and fixed at nearly a Right Angle ; Excision.*

—A man, aged forty-four years, who looked prematurely old, and all of whose fingers were crippled and deflected towards the ulnar border of the hands by osteo-arthritis of long standing, was able to walk only with great difficulty, as his right knee had become fixed nearly at a right angle. The joint was somewhat distorted by lipping of the articular borders and enlargement of the patella, and was so firmly locked that there was no prospect of altering its position by any means short of excision. Though the patient was poorly nourished, thin, and already grey, yet as his internal organs were sound he was advised to have the joint excised. At the operation the bones were in a condition of fatty degeneration, so that they were soft and oily. The wound, however, healed quite favourably and the patient left the hospital in seven weeks, firm synostosis having taken place.

The good progress of cases after the operation of excision of the knee largely depends on the method employed for securing and maintaining the close apposition of the ends of the bones. As the knee is the only instance in which synostosis after excision is not only desirable but absolutely essential to success, so it is the only case in which accurate coaptation is required. The method which has been used in all the cases mentioned above and found very satisfactory is a combination of Gant's splint and the use of sterilised steel pins. Gant's apparatus consists, it will be remembered, of (1) a simple back splint reaching from just below the tuberosity of the ischium to the lower part of the calf; and (2) an outside splint extending from the great trochanter to the foot, interrupted at the knee and furnished with a foot piece. First the limb is placed on the back splint, the tibia being raised to a level with the femur by additional pads placed under the whole length of the calf. The steel pins are next passed in a direction parallel to each other, one through the internal tuberosity of the tibia and the internal condyle of the femur, and the other through the external tuberosity and external condyle. Then the outside splint is applied. The arrangement secures an accurate apposition of the bones, and obviates the necessity for such firm bandaging of the limb as might lead to local congestion and muscular wasting. The pins are removed between the tenth and the fifteenth day. I have never seen them produce any unfavourable results. They are easily withdrawn by means of the clamp handle with which they are originally introduced.

ON THE PATHOLOGY AND CLINICAL HISTORY OF SOME RARE FORMS OF BONY ANKYLOSIS.

Not many years ago all that was taught about bony ankylosis could be summed up in two propositions : (a) That the only manner in which a joint could recover after it had been involved in suppuration was by the development of bony ankylosis. (b) That there was only one cause for bony ankylosis, namely, suppuration. It is now known that neither of these propositions is correct.

(a) Suppuration is not necessarily, either in acute or chronic cases that recover, followed by bony ankylosis. This is illustrated in regard to acute cases, in pyæmia, acute suppurative arthritis following wounds, the acute arthritis of infants, and in other instances. In all these conditions, if the joint concerned is freely opened and irrigated perfectly free movement may be preserved. Sometimes, if a joint, distended with pus as the consequence of pyæmic infection, is merely evacuated by aspiration, complete repair follows. Generally, however, when acute suppuration involves a joint, unless efficient treatment is at once employed ankylosis will take place ; but then, in the majority of cases, it will not be bony but fibrous in its character.

Undoubtedly some of the most complete examples of bony ankylosis that can be found are those which have followed acute suppuration. But the point I wish to emphasise is that bony ankylosis does not necessarily, or even commonly, follow acute suppuration. In chronic cases attended with suppuration bony ankylosis, instead of being the rule, is quite the exception. Thus, in tuberculous disease—for example, of the hip or the knee—should ankylosis follow, this, in the great majority, will not be bony but fibrous.

(b) Bony ankylosis often occurs quite independently of suppuration.

It is met with apart from suppuration in the following groups :

1. *In Tuberculosis*.—All are familiar with four results of tuberculous joint disease: (a) Perfect recovery when treatment is adopted early, and is adequately carried out. (b) Fibrous ankylosis; this, in a degree which varies widely in different instances, is very common. (c) Bony ankylosis after suppuration—as is seen, for instance, sometimes after hip disease. (d) Complete destruction of the articulation, calling for excision or amputation. But there is a fifth group. (e) In this group inflammation is from the first plastic, and is followed by the gradual development of complete synostosis. In these cases there is no suppuration and the inflammatory process is never active, there is little, if any, alteration of the articular ends, and the usual symptoms of inflammation are so little marked that the condition of the joint may, until stiffness attracts attention, entirely escape notice.

CASE I.—A girl, aged eleven, suffering with Pott's disease, was found to have her elbow completely stiff. She had complained of no pain, and the only thing her mother had noticed was that she used the limb awkwardly in feeding herself. On examination the elbow joint presented a natural appearance, but it was completely stiff, and the muscles were wasted. The stiffness proved to be permanent.

CASE II.—A girl, aged nine, had tuberculous disease of her knee. There was some synovial swelling, accompanied by flexion and slight heat. Leather splints were applied. Heat and swelling gradually subsided, but the joint became completely stiff. The patient has now been using the limb freely for the past ten years, and the knee is still quite fixed at the same angle.

I believe that in both these cases bony ankylosis has occurred. Of course there is no proof of this without maceration of the specimens, and examination of them in longitudinal section; but that bony ankylosis may occur in such instances is proved by the following examples.

CASE III.—The elbow-joint of a girl, aged fourteen, had gradually, without symptoms, become fixed at an angle of about 130° . To improve this position Dr. Walter Roughton, of New Barnet, performed excision. During the operation he found that complete bony ankylosis had taken place.

CASE IV.—A man, aged twenty-eight, was admitted into St. Bartholomew's Hospital with advanced tuberculous disease of his ankle joint. The synovial membrane was greatly thickened, and pulpy. The ligaments were softened, and the integuments were

thinned and dusky. No suppuration had occurred. The patient had advanced phthisis. Syme's amputation was performed. On dissection it was found that the synovial membrane was loaded with caseating tubercle. Complete bony ankylosis, however, had taken place between the astragalus and the os calcis. I have met with several other patients in whom tuberculous joints have undergone this quiet process of complete fixation, which, so far as could be judged, was one of bony ankylosis. It is important to notice that—as Cases III. and IV. above related definitely show—bony ankylosis takes place quite apart from the use of splints. In these cases splints had never been applied. Nor, so far as I am aware, are any means known by which ankylosis can be averted. Passive movements, by irritating the joint, rather tend to promote it, and I venture to think they are worse than useless. Ankylosis, as I have mentioned above, depends on the fact that the inflammatory process has an inherent tendency towards ossification of new material in a manner similar to that observed in the formation of callus in the repair of fractures.

I believe that this plastic form of tuberculous inflammation may also involve the spinal column. Figs. 7 and 8 show two cervical vertebræ very firmly ankylosed together. They are neither altered in shape nor eroded even superficially. No history of the specimen is known; but I believe the condition has resulted from tuberculous inflammation, followed by the organization of the inflammatory products into bone.

2. I would now ask whether bony ankylosis

occurs in Charcot's disease, apart from suppuration attending perforating ulcer? The great majority of observers, I believe, would answer in the negative. Yet, I think there is evidence to throw some doubt on this conclusion.

Charcot* has described a tabetic foot in which the under surface of the astragalus presented bony vege-

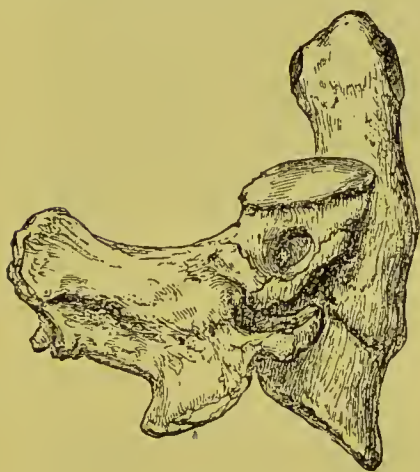


Fig. 7.

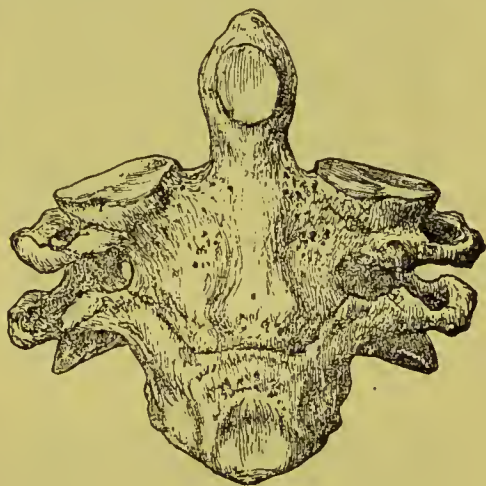


Fig. 8.

Complete bony ankylosis between the bodies and neural arches of the second and third cervical vertebræ (No. 1078, Museum of St. Bartholomew's Hospital).

tations. The scaphoid and cuboid were scarcely recognisable, and the internal cuneiform was fused with the first metatarsal, and the middle cuneiform with the second metatarsal bone. All the tarsal and metatarsal bones were spongy and friable. Charcot remarks that these complex lesions, occurring apart from traumatism and suppuration, can only be classified as definite osseous and articular changes accompanying tabes.

Figs. 9 and 10 represent two remarkable skeletons

* *Progrès Médical*, 1883, p. 606.

of feet in the Museum of the University of Cambridge. My attention was drawn to them by Dr. Joseph



FIG. 9.—Bony ankylosis of the foot (Museum of the University of Cambridge).

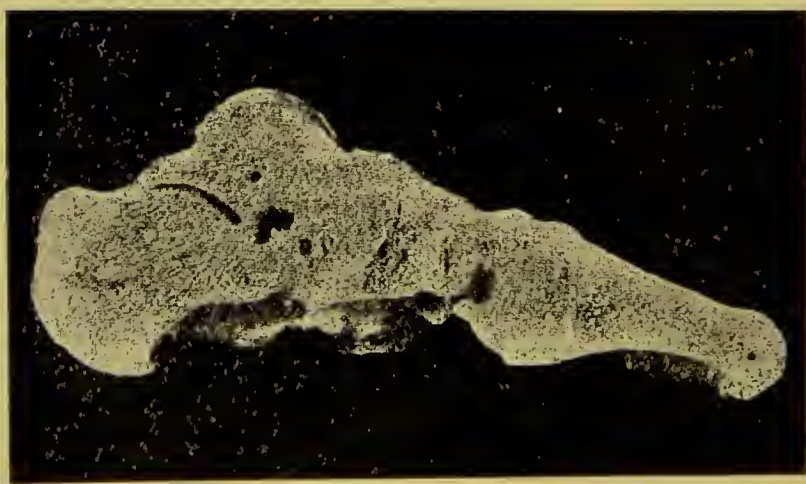


FIG. 10.—Bony ankylosis of the foot. Some of the tarsal joints are obliterated, but others are but little changed, and ankylosis is due to the formation of plates and vegetations on the surface of the bones (Museum of the University of Cambridge).

Griffiths. These feet are the seat of almost universal bony ankylosis, owing to the fact that the superficial surfaces of the different bones are covered with

vegetations and continuous bony deposits, which bridge over the interval between them. On section, however, it is discovered that some of the joints themselves are very little changed. Their cavities can still be traced, and even the articular cartilages can be recognised. Some of the tarsal and phalangeal joints, however, have undergone such complete synostosis that no vestige of their cavities remains. The history of the cases from which these specimens were derived is unfortunately unknown. I have never seen such conditions before. How are the appearances to be explained? At first sight they might be attributed to suppuration—probably of septic origin. But, in the first place, there is very little alteration in shape, and very little erosion of the bones, such as would be expected in widespread and prolonged suppuration; secondly, many of the joints are but little changed; yet in septic cases it is upon the joints themselves, through their synovial membranes, that the main stress falls; thirdly, the sesamoid bones of the great toe are much increased in size—a change that, so far as is known, would not be produced merely by inflammation going on to suppuration. The complete bony ankylosis which is present in some of the phalangeal joints is a condition that may follow suppuration. But here, again, the bones are not eroded or altered in shape; they are simply synostosed. The formation of osteophytic outgrowths and low-crowned buds and vegetations, which is so marked a feature in these specimens, and which was present in Charcot's case, is well shown in a tabetic foot in the Museum of St. Bartholomew's Hospital (No. 691E). In this specimen, although no suppu-

ration had occurred, the tibia and the fibula are ankylosed together by bone.

3. In a case in which the median nerve had been divided and the hand had become clawed, Mr. Bowlby found* that bony ankylosis had occurred in one of the interphalangeal joints of the ring-finger, while several of the other finger-joints were stiff, although as yet ankylosis had not taken place. This specimen is the only example of bony ankylosis after nerve-section that I have met with.

4. It is well known that in gout and (5) gonorrhoeal rheumatism bony ankylosis occurs entirely apart from suppuration.

6. In some instances severe contusion of the articular surfaces of a joint may be followed by bony ankylosis. I have seen this result follow in the temporo-maxillary joint after a heavy fall upon the chin.

7. Bony ankylosis is not very uncommon in the spine in the more extreme forms of lateral curvature. It has occurred in specimens No. 2103 and 2104 in the Museum of the College of Surgeons, and in E52 and E54 in the Museum of St. Thomas's Hospital. The vertebræ are fused together in the concavity of the curve. Similar examples may be found in almost every large pathological collection.

8. I now pass to a group of cases in which multiple bony ankylosis of large joints has occurred where no suppuration has taken place.

CASE V.—In 1889 a groom,† aged twenty-nine, was admitted into St. Bartholomew's Hospital. Four years

* St. Bartholomew's Hospital Museum.

† The case has been already mentioned on p. 74.

before, he was said to have had rheumatic fever, for which he was in bed fourteen weeks. At the end of this time he was able to walk, but his joints gradually became stiff, and for three years he had been bedridden. On his admission the hips and knees were flexed, and the feet were in a position of talipes equinus. All the large joints of the lower extremities were firmly fixed. His remaining joints were all free.

CASE VI.—Dr. Griffiths, of Cambridge, has given me notes of the following case. Three years ago a woman, aged twenty, had the first phalangeal joint of the index finger swollen and painful. Pain and swelling after a time subsided, but the joint was left ankylosed. Other finger-joints underwent similar changes, then the wrists, and, later, the elbows swelled and were painful, and they also ultimately became quite stiff. In an attempt to improve the position of the left elbow the humerus was fractured. At the present time several finger-joints, both wrists, and both elbows are quite stiff. Some other joints are rather swollen, but in several Dr. Griffiths finds no swelling, no nodules, and no thickening of the bones. The ankles are swollen, but movement in them is free. The knees are somewhat swollen and stiff. Several joints are natural.

CASE VII.—Dr. Hilton Fagge relates the following instance : * A man, aged thirty-four, was admitted into Guy's Hospital in 1874. In the previous year his spine became stiff, and formed a rounded curve ; later the right hip became fixed. He died of chest troubles followed by difficulty of respiration. At the *post-*

* *Path. Soc. Trans.*, vol. xxviii. 1877, p. 203.

mortem examination the arches and the spinous processes of the dorsal vertebræ were found completely ankylosed, and so were the articular processes (Fig. 11). The vertebræ were much softened, and could be cut with a knife, and the spine had become fractured in placing the body in the shell. The ribs were firmly

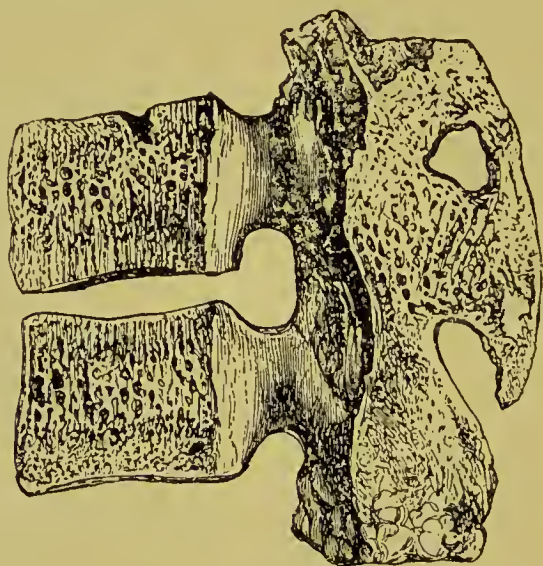


FIG. 11.—Dr. Fagge's specimen of bony ankylosis of the spine.

and extensively ankylosed to the vertebræ. The right hip was also ankylosed.

I have mentioned that bony ankylosis may occur in the spine in tuberculous disease, in lateral curvature, and in such cases as that recorded by Dr. Fagge.

9. It is well known that bony ankylosis is also common in the spine in Osteo-arthritis. On examining specimens illustrating this condition—and they can be found in any large museum—it is seen that the ankylosis is produced either by (*a*) ossification of

the anterior common and other ligaments (Fig. 12), or (*b*) by the formation of buttresses of bone passing



FIG. 12.—Ankylosis of the spine produced by ossification of the anterior common ligament (Museum of the University of Cambridge).

from one vertebra to another (Fig. 13). In many instances the ribs are firmly ankylosed to the bodies and transverse processes of the vertebræ by ossifi-

cation of the costo-vertebral and costo-transverse ligaments. On making a longitudinal section of the spinal column, it is found that the ankylosis is entirely limited to the external surface of the vertebræ. The spaces between the bodies, which are occu-

pied by the intervertebral discs, are seen in dried specimens to be in no way encroached upon.

It will thus be observed that bony ankylosis, apart from suppuration, may occur in the spine, as in the limbs, in three different ways: (*a*) by direct and complete fusion of the component bones; (*b*) by ossification of the ligaments; and (*c*) by the development of bony buttresses or plates, the joints remaining unaffected. I may add that bony ankylosis may involve the spine



FIG. 13.—Ankylosis of the spine produced by the formation of bony buttresses (Museum of the University of Cambridge).

only, or the spine may be involved in common with the limbs.

The examples I have related show that bony ankylosis is sometimes a reparative and sometimes a degenerative process. When it occurs in acutely inflamed joints—for example, in the course of pyæmia or acute suppurative arthritis following a punctured wound—bony ankylosis is reparative, and closely

resembles the union of a fracture. It is reparative also when it occurs in tuberculous disease of the joints or spine. In all these instances inflammatory exudation is converted into normal bone to the advantage of the individual concerned. In other cases bony ankylosis is associated with and is a part of wide degenerative changes in the structures involved. In Fagge's case, as already mentioned, the vertebræ could be cut with a knife, and the spine had been fractured while the body was being lifted to place it in the shell. It was degenerative in the case recorded by Charcot and in the feet in the Cambridge Museum. It is degenerative, again, in gout, and after nerve injuries, so also when it is multiple, as in Cases V. and VI. It must be termed degenerative also where it replaces the normal structures by a tissue which is inappropriate for the discharge of the functions of the part, for example, in ossification of the ligaments of the spine, and of the joints and ligaments of the ribs.

The true pathology of many forms of bony ankylosis, such as those illustrated by Cases V., VI., and VII., is at present, I believe, unknown.

I will not enter at any length upon the clinical aspect of cases of bony ankylosis. I will only enumerate four propositions: 1. Whenever this condition seems likely to occur, great care should be taken to keep the joint concerned in a useful position. 2. We know of no means by which a threatened bony ankylosis can be averted. 3. The use of passive movements cannot prevent bony ankylosis. Indeed, by maintaining irritation and promoting inflammatory exudation, it is likely to produce a directly opposite result.

4. When bony ankylosis has occurred, excision or osteotomy may be freely employed, in order to correct any deformity that has taken place, for by methods that are now available these operations are attended with scarcely an appreciable risk.

POINTS OF INTEREST IN CONNECTION WITH VARIOUS FORMS OF ABSCESS.

ALL the general facts appertaining to the subject of abscess are so well known that it would be useless to repeat them. But when we get a little off the beaten track, rare instances are met with, difficulties in diagnosis are encountered, and important complications present themselves, which are deserving of careful study. The following notes are fragmentary, yet I hope they may be of sufficient interest to justify their publication.

Diagnosis of Acute Abscess.—There are numerous instances of acute suppuration in which it is essential that pus should be evacuated immediately, and while it is still in small quantity. This is the case in such familiar examples as suppuration in the sheaths of tendons, by the side of the bowel, under the periosteum, in the neighbourhood of the joints in children, and many others. It is therefore important that both the absolute and the relative value of the signs which indicate that pus has formed in a part should be clearly recognised. In the majority of the hand-books of the day, however, this question is lightly passed over, nor is any distinct line drawn between the symptoms of acute inflammation and those

which indicate that the further stage of suppuration has been reached. Many if asked what is the evidence that matter has formed in a part would answer, the "presence of fluctuation." In cases of large chronic or cold abscesses, such as iliac or psoas abscesses, or those resulting from hip disease, this would be correct. But in small, acute abscesses, especially when they are deeply seated, it would be entirely wrong. This becomes clear when the nature of fluctuation itself and the conditions which are necessary for its development are borne in mind.

The term means the wave-like displacement of fluid from one part of a cavity to another under the influence of pressure. For instance, in a psoas abscess, when pressure is made alternately upon the upper and the lower parts of the swelling, the fluid is made to pass, like a wave, backwards and forwards, between the two points.

In searching for fluctuation the fingers, a little flexed upon the metacarpal bones, must themselves be held straight. If they are flexed their ends only touch the surface. When they are straight the highly sensitive skin covering the palmar aspect of their tips is brought into use.

In small and superficial collections of matter fluctuation is best produced by using only one finger of each hand, and pressing quite lightly. In larger and deeper collections the proceeding is different. Two or three fingers of each hand are used ; and these are pressed firmly and equally on the surface until a certain degree of tension has been produced, and then, while this tension is still maintained, further pressure is made by the two hands alternately. If

this preliminary of establishing some tension is omitted no fluctuation will be obtained, even although a large collection of pus is present. Another method is to place the fingers of the left hand, which may be called the "watching" hand, on some part of the suspected area, while with the fingers of the right, or "displacing" hand, pressure is made on different parts, so that the watching fingers may feel a wave of matter rise against them. The watching hand is then shifted to some other point in the suspected area, and the manœuvre is repeated. This wave-like protrusion under the watching hand is often perfectly conclusive.

Many abscesses are so situated, or are, in some portions of their extent, so deeply placed, that they do not fluctuate in all their bulk, but only when pressure is made on certain points. It is necessary, therefore, before concluding that fluctuation cannot be obtained, to examine for it by moving the fingers from place to place, over the suspected area, until every part has been thoroughly searched. It may in some cases take some minute or more to hit upon the only two points between which fluctuation can be produced.

Students at first experience a difficulty in distinguishing between true fluctuation and the mere displacement of the substance of a relaxed muscle. If, for instance, alternate pressure is made upon two points on the same horizontal level, and about two inches apart, in the front of the thigh, what seems exactly like fluctuation is obtained. No doubt the displacement of a soft solid, and the displacement—that is fluctuation—of fluid, produce very much the

same sensation, but practice brings the ability to distinguish between them. In the one case there is mere displacement, in the other, to mere displacement there is added such a high degree of elasticity as is produced only when fluid is present, and which experience alone will enable the observer to appreciate. The student will find it very useful to study fluctuation by means of a sheep's or calf's bladder filled but not distended with water, and laid on a firm surface and covered with layers of blanket the thickness of which is gradually increased.

I may next turn to the question how far fluctuation can be regarded as an adequate evidence that inflammation has issued in suppuration, and that matter has formed.

Now, fluctuation is a physical phenomenon, and it therefore postulates certain conditions.

(a) In the first place matter must be confined in a circumscribed cavity, and not merely diffused in the subcutaneous connective tissue and fat, or in the interspaces of a limb.

(b) There must be matter enough to be displaced in an appreciable manner, that is, there must be, even if it is superficial, at least a teaspoonful. If deeply placed, for example, in the popliteal space, or beneath the gluteus maximus, a much larger amount will be required.

(c) The parts covering it must be sufficiently thin; for if matter is behind the mammary gland it cannot be made to fluctuate; nor could it if it were around the dorsal surface of the kidney, and therefore covered by the fat, muscles, and fascia of the abdominal wall.

(d) The parts covering it must be pliant. Fluctuation could not be produced if the front of the abscess were covered with a piece of cardboard ; and, in the same way, it cannot be detected when the superjacent parts are indurated and brawny, as they often are, *e.g.*, in the side of the neck, the breast, the lumbar region, and the ischio-rectal fossa.

(e) There must be a firm background. If a bladder filled with water is placed on a table fluctuation can easily be produced, but if it is placed on a thick bed of cotton wool, this is no longer the case, for when pressure is made upon it it recedes in mass, and no to-and-fro movement of its contents will take place.

(f) The part concerned must not be very sensitive. If an acute abscess has formed, *e.g.*, in the mammary gland, the testis, the parotid gland, or in the sheath of a tendon, pressure produces such exquisite pain that its employment is not justifiable unless an anæsthetic is used.

Now, if these six conditions which are necessary for the detection of fluctuation are recalled, it will be seen that there is only one general group of abscesses in which they are all present. This group consists of abscesses which contain at least a drachm of matter, which are fairly superficial, and unassociated with brawny infiltration of the parts that cover them, and which are not very tender. They are best illustrated by psoas and iliac abscesses, chronic abscesses in the subcutaneous tissue, and those large flaccid abscesses which are met with in the course of pyæmia. In fact, it amounts to this. The value of fluctuation as evidence of suppuration is, practically, limited to *chronic* and not very small abscesses. In the

diagnosis of other forms of abscess you must rely on evidence of a different kind, for some of these conditions are absent, so that fluctuation cannot be, or ought not to be produced. (*a*) Suppuration is often diffused—*e.g.*, in cellulitis of the neck, hand, forearm, and other parts—so that the pus, like water diffused through the loculi of a sponge, does not admit of wave-like displacement. (*b*) In numerous instances of acute abscess, pus obviously ought to be let out when only a few drops have formed—in the sheath of a tendon, by the side of the bowel, near the urethra, in the side of the neck, and in many other situations. It is said that Sir Benjamin Brodie, on receiving an urgent summons to a house in his neighbourhood, found a patient in great suffering from acute inflammation beneath a corn. Suspecting suppuration, he shaved off the corn, layer by layer; at last a single drop of matter welled up, and the patient, the moment the tension that had been present was relieved, slapped Brodie on the back, and exclaimed, “Thank God; I am in heaven!” (*c*) Many abscesses are too deeply placed for fluctuation, *e.g.*, in the loin around the kidney, in the substance of, or behind the mammary gland, or under a thick stratum of muscles. (*d*) Many are covered by structures that, instead of being pliant, are firm and rigid, *e.g.*, the fascia lata in the popliteal space, or the brawny and indurated integument and subcutaneous tissue at the nape of the neck, in the gluteal region, and other parts. (*e*) In such parts as the axilla, the abdominal wall, and the ischio-rectal fossa, there is no firm background, so that when pressure is made upon it the abscess merely

recedes as a whole, and no fluctuation can be produced. (*f*) Exquisite pain would be produced by an attempt to obtain fluctuation in acute abscesses in the breast, testis, tendon-sheaths, and in many other parts.

It thus becomes obvious that there are numerous cases in which fluctuation as evidence of suppuration cannot be relied on; and it will be noticed that it is precisely in those cases in which it is most imperative to detect the presence of matter while only a few drops are present, that fluctuation as an evidence of the presence of pus is so entirely worthless.

But, as this is the case, what other tests are there on which to rely? There are several: some suitable for one case, and some for another; and if the student learns how and when each should be used, he will seldom have any great difficulty in ascertaining whether pus is present.

1. *Elasticity*.—Although an abscess is too small for fluctuation, it may be found that it is elastic in the same complete degree as are hydroceles, thin-walled bursæ, and many cysts. A small superficial chronic abscess in the breast, or in the subcutaneous tissue, is a good example of this. The observer examines for elasticity here just as he would if he suspected hydrocele of the tunica vaginalis—steadyng the swelling, and making it tense with one hand and pressing with one or two fingers of the other hand over different parts of its summit. The test is a critical one, and without a good deal of experience and a great deal of care, it is very easy to mistake the partial elasticity of a soft solid—*e.g.*, a fatty

tumour, or a sarcoma which is breaking down—for the perfect elasticity of a collection of pus.

There are some who do not distinguish between fluctuation and elasticity. They say, for instance, that they detect fluctuation in a hydrocele, when they only make the sac tense and press with one finger. The two phenomena, however, are distinct things and should be used as different tests. No doubt, where fluctuation can be detected there elasticity can be detected also ; and it may be used as confirmatory evidence. But the point is that in abscesses which are too small for fluctuation elasticity can often be detected.

In cases in which the inflammatory process is acute, and in which, if matter forms, it is imperative that it should be immediately evacuated, there are other signs which will be found trustworthy ; these are the following : —

2. *Pitting on Pressure*.—If the tip of the finger—held nearly horizontally—is placed on or near the summit of the inflamed area and pressure is made at first very gently, but then a little more firmly, and if this pressure is continued for ten or fifteen seconds, or a little longer, when the finger is removed a sharp-edged shallow pit, such as would be produced by similar pressure on soft putty, may be observed. This symptom is termed “pitting on pressure.” When it is met with in an area of acute inflammation its explanation is that the tissues are softened, and infiltrated with serum and partially coagulated lymph, which are easily displaced by slight pressure. Now when this softening and infiltration have occurred in the circumferential part of an acutely

inflamed area, it is in a high degree probable that in the centre the process is still further advanced, and that the point of suppuration has been reached. In other words, when this pitting on pressure is observed, for instance, in a case of acute inflammation of the breast or of the side of the neck, it is so nearly certain that pus has formed that steps for its evacuation ought to be taken without delay.

There are, however, obviously, numerous conditions, apart from suppuration, in which pressure will lead to pitting—anasarca, œdema from venous or lymphatic obstruction, acute subcutaneous emphysema, and others. So that before pitting on pressure can be relied on as evidence that pus has formed, all the circumstances of the case must be carefully weighed. Other conditions which would produce it must be excluded, and there must be symptoms to indicate that the case is one of acute local inflammation. In such a case when pitting can be detected there will be swelling, heat, redness of the skin, pain and tenderness as evidences of this. Practical experience shows that in a case of acute local inflammation pitting on pressure is so nearly conclusive of suppuration that, when it is present, the part beneath it should be at once explored. Almost always a collection of pus, though it may be only a few drops, will be found. Sometimes, however, in diffuse cellulitis, pitting is present when pus is scattered in the areolar spaces, and not yet enclosed in a distinct cavity. But, even here, pitting is still a safe guide, for in such a case an incision is urgently required.

3. *The tender spot.*—In a case of acute local inflammation, *e.g.*, in the side of the neck, or in the

breast, attended with redness of the skin, and swelling, if the finger—applied with a slight degree of pressure—is passed over the surface, some spot may be found which is so markedly tender that when it is touched the patient winces and complains of sharp pain. The meaning of the tender spot is this : Beneath it there is a collection of pus, at present submerged, but yet not far from the surface, so that pressure made directly over it causes an acutely painful sensation.

4. *The Soft Spot*.—When the finger is passed over the surface in such cases of local inflammation as I have just mentioned, it is often found that, while the general area is solid and brawny, there is some particular spot which is quite soft. This soft spot is generally small and clearly defined : in other cases it is irregular and more extensive. But the point is that, while the parts around are firm and indurated, here the finger sinks into a soft place—the edges of which are generally distinct and abrupt.

These two spots—the tender spot and the soft spot—must be considered together. The tender spot indicates a collection of pus well below the surface ; the soft spot shows that the parts have undergone inflammatory softening, and that pus, travelling in the direction of least resistance, is now lying close beneath the skin. Leave affairs to take their own course for a few hours longer, and, as the skin becomes undermined and softened, it will be carried forward into a distinct prominence, and the matter will “point” and then soon break through and escape. It will be noticed that these three conditions—the tender spot, the soft spot, and “point-

ing"—mark successive stages in the passage of matter to the surface, *i.e.*, the tender spot of to-day will be the soft spot of to-morrow, and the situation in which matter will "point" a day or two later.

These phenomena—the tender spot and the soft spot—are of great value, for they not only show that pus has formed, but they show also where it is nearest to, and will ultimately reach, the surface; in other words, where it should be let out. They must not be ignored. If they are, in the first place there will often be no means of detecting pus as soon as the case requires; and, secondly, if, suspecting matter, the surgeon determines to explore, the result may be very unsatisfactory. He may fail to find the pus, or he may find it when it is a long way from the surface. This will involve three considerable drawbacks. First, he may have to make so deep an incision that some important structure may be wounded; secondly, drainage through a thick layer of indurated tissue will be difficult; and thirdly, in spite of an incision elsewhere, pus will, at least in many instances, point and discharge itself through the skin in the situation in which it originally threatened to do so. Good surgery clearly demands that the incision should be made over the seat of future pointing; for here pus is most superficial, and will ultimately reach the surface; here only a thin stratum of tissue will be divided, and here free and complete drainage will be secured.

5. Sometimes a *deep-seated swelling*, in which, however, neither fluctuation nor elasticity can be detected, may constitute the only evidence—and yet, in the circumstances of the case, evidence enough

—that matter is present. Thus a swelling under the glutei, just behind the great trochanter, in a case of tuberculous hip disease will, in all probability, be a chronic abscess, and may be reasonably explored in this anticipation.

6. In some instances the surgeon may advisedly act on the assumption that matter has formed, not because he can secure any evidence of its presence, but merely because a certain time has elapsed since the commencement of acute inflammation. Thus, if acute inflammation in the sheath of a tendon, say of a finger, attended with pain, swelling, and redness, has been going on for three or four days, or if there has been acute inflammation in the ischio-rectal fossa for the same time, it is right—on the ground that, in the time that has elapsed, suppuration will probably have occurred—to make a carefully planned exploratory incision. In the majority of cases pus will be found. The less the better. The object, of course, must be to interfere at the earliest possible moment—at the very commencement of suppuration—for to wait, when once pus has formed, involves a prolongation of the patient's suffering, and also an increase of injury to the structures concerned. Nor need the operator be concerned if no pus is found. An incision, when proper care is used, will, by relieving tension, and by evacuating inflammatory products of an irritating nature, arrest the process before the stage of suppuration is reached, and will thus save time and suffering, and avert dangers of a serious kind.

These six indications of the existence of pus will—some in one case and some in another—enable you

to detect suppuration in the great majority of cases, They should be studied as carefully and as often as possible. Without great care and much experience, mistakes, oversights, and delays are inevitable.

Differential Diagnosis.—This is seldom difficult in acute abscess; yet it may be. Thus cases occur in which it is very difficult to say whether a patient has an abscess or a rapidly growing scirrhus of the breast. In both there may be rapid enlargement, dusky congestion of the skin, heat of the surface, and brawny induration. The physical symptoms may be, in fact, so much alike in the two conditions, that a mistake can be avoided only by a very careful study of all the attendant circumstances, or perhaps only by exploratory examination. In regard to them, almost every surgeon has made mistakes. He is happy who has no serious consequences of his erroneous diagnosis to regret. Again a chronic abscess and a fatty tumour present many points of close similarity. The increase in size of both is slow and painless, the skin over both is generally normal, and both are elastic. Two of the usual features of a fatty tumour—a clearly defined outline, and a border that slips away under pressure—may be absent, for the tumour may merge insensibly into the surrounding fat, and it may, when of long duration, become more or less fixed by adhesions: while its third, and most characteristic feature, “dimpling” when the skin is made tight over it, may be exactly imitated in a small chronic abscess lying deep beneath a thick stratum of fat, for this overlying fat may dimple as if a fatty tumour itself was present. In practice the chances of error must be remembered, and all possible

care must be used. Yet, after all, a mistake though; it may discredit you, will lead to no serious result. In both cases the first step when you come to operate will be an incision and this will set you right.

2. It is sometimes very difficult not to mistake a chronic abscess and a malignant growth the one for the other, for instance, in the breast, popliteal space, or iliac fossa. They may both be painless, may develop at about equal rates—so that there is a history in each of two or three months, or longer—and their physical characters may present a very high degree of similarity. Always, unless you feel quite sure—sometimes a dangerous state of mind—as a matter of precaution use an exploring syringe, or cut into the swelling before you finally decide as to treatment.

I will not now enter upon the subject of the best method of opening abscesses, or on the question of after treatment. I will only express the opinion that, as a rule, to which there are but very few exceptions, pus should be evacuated as soon as it is detected, for, like urine or fæces it is an excretion, a substance that has been cast out beyond the pale of the economy. It can serve no useful purpose; on the contrary, it may act prejudicially in many ways and in many degrees of urgency. Its presence, even if it is not actively mischievous, delays recovery. Often, however, when acute it produces tension, and severe pain, and wide burrowing. But let me leave these familiar effects and allude to some of the calamities that may result from the manner in which pus may erode structures with which it comes into con-

tact. This eroding action of pus is most graphically displayed in the vertebræ, the acetabulum, the articular ends of the long bones, and the tarsus and carpus—parts that are sometimes completely destroyed. But it is when the coats of large blood vessels are involved that the calamities I have referred to are met with. I remember instances in which the following vessels have been perforated by this erosion:—the common, internal, and external carotids, the internal jugular vein, the external iliac artery and vein, the femoral artery and vein, the gluteal artery, the internal pudic artery, and even the aorta. And it is a noteworthy fact that in many of these cases the abscess was chronic, and characterised by no feature suggesting danger in any form.

Here are three specimens from the museum in which the aorta has been thus perforated, and what more dread calamity could befall a patient? No. 1388 shows the arch of the aorta of a boy of eight, opened by the extension into it of an abscess formed in the root of the neck, of uncertain origin.

No. 1440 is the arch of the aorta from a man of 31, perforated by a chronic abscess, probably glandular, at the root of the neck; and No. 1439 is the abdominal aorta of a man aged 28, into which a psoas abscess, connected with spinal caries, made its way.

It is, as a general rule, only large arteries which are involved in accidents of this description.

Hæmorrhage from small arteries, under similar circumstances is, I think, very rare, and the explanation, no doubt, is that a small artery in proximity

with an abscess is usually obliterated by the inflammatory process in which it is involved, while the larger trunks cannot be the seat of such protective closure. The formation of a communication between an abscess and a large artery is an occurrence grave in the highest degree. The result is very generally fatal. The treatment is attended with difficulties which usually prove insuperable. Space will not allow me to discuss this subject, for a large number of points would present themselves. My object in alluding to this group of cases has been to direct attention to them in their bearing on the early opening of abscesses. Pus can now be evacuated, due care being used, without the danger of any unfavourable result. And, besides, the more frequently mentioned grounds for early interference—the saving of time, the relief of pain (in acute cases), and the prevention of burrowing—the fact that the eroding action of pus may, though such an event is fortunately rare, lead to perforation of some large blood-vessel, is another ground for its removal without any long delay.

Abscess in Connection with the Ribs.—Suppuration about a rib is generally due to periostitis which, although sometimes syphilitic is in a large majority of instances either tuberculous, or a sequel of typhoid fever. In the latter group of cases the affection has its parallel in periostitis of the tibia, humerus, ulna, and other bones. But whether a costal abscess is tuberculous or a sequel of typhoid fever, there are several points in connection with it which deserve attention. (1) The periosteum, especially in young subjects (in whom these abscesses are most likely to occur) is

easily detached, so that unless pus is evacuated while it is still in small quantity, an inch or more of a rib may be involved, with the result that it may become the seat of rarefying osteitis, extending deeply into its substance and rendering it liable to spontaneous fracture. (2) If the mischief is seated near the junction of a rib with its cartilage, separation between them may occur. I have seen this separation take place between three adjacent ribs and their cartilages. In a tuberculous case repair is quite improbable, and the two free ends, whenever the patient coughs, and even when the pectoral muscle acts, slip over each other, and cause, though not severe pain, yet a sensation the frequent repetition of which is very distressing to the patient. In a lady aged fifty-five, who was dying of tuberculous hip-disease and phthisis, spontaneous fracture of the second rib, or possibly separation of this rib from its cartilage, took place during a not very severe fit of coughing. No repair followed, and in the three months which elapsed before her death the patient was much disturbed by the rubbing of the free ends together, whenever she coughed or moved her arm at all freely. (3) The mischief may be limited to the anterior aspect of the rib, but this, I believe, is rare. Much more commonly the posterior part of the rib as well is involved, so that when suppuration occurs pus collects not only in front, but also at the back of the rib, so as to constitute what may be termed a post-costal abscess. (4) Prognosis in these cases depends very largely on the treatment that is adopted. If treatment is appropriate, recovery, though it may be tedious, will

take place in a large proportion of instances: while on the other hand it would be difficult to mention an affection which, when treatment is defective, gives rise to more trouble and disappointment. Indeed, conditions may readily be established, the repair of which, whatever measures are adopted, cannot be secured.

Treatment.—In the first place, any flaw in the aseptic method is equivalent to failure, and no step which can conduce to its maintenance must be neglected.

It is necessary to bear in mind the probability that both aspects of the rib—the anterior and the posterior—are involved. And the question arises whether an attempt should be made to complete the necessary treatment at once, or whether it should be carried out in two stages. If the former method is decided upon, after the abscess which presents anteriorly has been opened, search must be made for an opening through the intercostal space adjacent to the affected rib. This opening, which is often very small, must be cautiously enlarged, and the position and limits of the cavity behind the rib must be fully ascertained. This cavity must then be scraped, and thoroughly cleared of granulation tissue, and sponged out either with carbolic lotion or perchloride solution. Sterilised gauze drain should then be introduced, and the wound dressed aseptically. Should the superficial part of the abscess be large, so that it contains say three or four drachms of pus, it may be better to perform the operation by two stages. On the first occasion the superficial abscess must be freely laid open, and its cavity thoroughly cleared, drainage

being used if necessary. Thus treated, a superficial abscess will soon be reduced to the dimensions of a sinus, from which a small amount of discharge will persist. When this stage has been reached, the sinus, along which a grooved director has been passed, is laid open, and the point where it passes through the intercostal space is ascertained. This opening is then enlarged, and the post-costal abscess is cleared out. This cavity is then drained as before, and the wound dressed. I have met in the last four years, with five instances of this form of abscess, and I have usually operated in two stages. For, if the operation is completed in one stage, there must, I have thought, be a danger that pus from the superficial part of the abscess may inoculate the freshly divided tissues and deeper parts of the wound, and interfere with immediate healing—which it is so important to secure. If the intercostal space is very narrow, it may be necessary, in order to obtain room, to cut away a portion of one of the ribs. This should always be done if the abscess is large, or of long standing.

“*Shirt Stud*” Abscess of the Abdominal Wall.—Mrs. R., aged thirty-six, who had had five children, and who was stout and fat, was admitted with a prominent, distinctly defined swelling, about four inches in diameter, on the front of the abdomen, which at first sight very much resembled an ordinary umbilical hernia. On examination, however, it was noticed that the swelling was entirely below the umbilicus, which was clear of it by an inch and a half, and of natural appearance. The swelling was elastic, dull on percussion, and uniform in consistence; nothing

resembling indurated masses of omentum could be felt in it, nor could any part of it be returned by taxis. There was some tenderness, together with redness of the skin over the front of the swelling at its lowest part. The patient had noticed the swelling for three weeks, and it had, she said, been steadily increasing in size. Three days later the skin where it had been red was œdematous, and pitted on pressure, and the patient's temperature was 101° . On cutting down upon it, I found that the swelling was due to an abscess unconnected with any hernial protrusion. The abscess cavity was cleared in the usual manner, and a drainage tube was kept in for five days, when healing seemed nearly complete. A sinus, however, persisted, discharging a little thin serum. This condition of things continued for a fortnight, when a swelling as large as the original one quickly formed, attended with much pain, redness of the skin, and a rise of temperature to 102° . This fresh collection of pus was evacuated, and the cavity was freely laid open; and all its lining of granulation tissue was removed. On now making a close search, I found a pin-hole opening leading through the linea alba, two inches below the umbilicus. When this was enlarged, the finger could be passed into a cavity situated in the sub-peritoneal tissue behind the recti, and holding about three ounces of pus. Whilst I was exploring this cavity the softened wall gave way, and the peritoneal sac was opened. The hole was at once protected and closed by sutures. The abscess was now sponged out, irrigated, and subsequently drained. Sound healing followed and the patient has had no further trouble. In this case there was

a history of peri-uterine inflammation, following parturition some years before, and the explanation of the abscess no doubt was that chronic peritonitis had at length resulted in suppuration, and the formation of an abscess in the sub-peritoneal tissue behind the anterior abdominal wall. Pus had then found its way through an opening in the linea alba, and had collected in the subcutaneous tissue.

A common feature in the cases I have described is that suppuration takes place behind some firm fascial or muscular stratum, through which pus works its way by a pin-hole orifice, and then collects on a superficial plane, so that the two parts of the abscess are separated from each other by an hour-glass or shirt-stud constriction. This anatomical peculiarity may be easily overlooked, and the probability that it exists should be kept in mind whenever a collection of matter has a sheet of strong fascia or a muscular plane for its background, or where, though matter is now superficial, anatomical considerations render it not unlikely that suppuration has had a deeper source. The cases I have related are clear instances, but others—not at all less likely to lead to an oversight—can be mentioned. Thus a subcutaneous abscess in the neck may be the superficial part of a collection of pus derived from suppuration in a gland lying at some distance beneath the deep cervical fascia. Or pus found on the front of the mammary gland may have formed behind or in the mid-substance of the gland, and have travelled towards the surface by a narrow passage through the gland, so that the abscess is of the “shirt-stud” variety. Oversights,

in such cases, can only be avoided when the parts are thoroughly examined.

In dealing with this kind of abscess, the treatment, as I have mentioned above, may be conducted either by a single or in two stages.

The operation in two stages should be adopted where the deeper part of the abscess is in contact with important structures. Had the abscess in Mrs. R.'s case been followed through the abdominal wall at first, it is probable that, in the clearing away of granulation tissue, the peritoneum might have been broken through, and pus might readily have escaped, perhaps unnoticed, in considerable quantity into the abdominal cavity. As it was, though the peritoneum gave way, the accident was detected and no harm followed.

In a case in the Hospital two years ago, a man aged twenty-seven had an abscess containing about an ounce of pus over the seventh and eighth ribs, in a line with the nipple. Its deep part had burrowed behind the ribs, so that there was here a cavity about two inches in its horizontal extent. To clear this out was a somewhat difficult proceeding, and one which would have been by no means facilitated had the structures concerned been bathed in pus.

Sub-Pectoral and Sub-Gluteal Abscess. — There are two situations in which, as the result of the anatomical arrangement of the structures concerned, an abscess allowed to become septic may lead to very grave, and even fatal consequences. These are the cellular planes beneath the pectoralis major, and the gluteus maximus. The danger arises from the fact that the loose bed of connective tissue in which

suppuration originally occurred extends widely in a horizontal direction beneath firm structures through which pus cannot make its way towards the surface.

Sub-Pectoral Abscess.—In the axilla covered-in by the pectoralis major, pus may make its way forwards beneath this muscle to the middle of the sternum, backwards beneath the scapular muscles, and downwards in the arm along the vessels and large nerves. It may even, as it burrows in the cellular tissue along the lines of least resistance, find its way into the shoulder-joint. Some years ago a middle-aged man was admitted into St. Bartholomew's Hospital who had suppuration in his axilla around tuberculous glands. The abscess had been opened two months before by a simple incision, and a poultice had been applied. Septic infection followed. The patient on admission had an evening temperature of 101° , and two sinuses were discharging freely, one on the thoracic side of the axilla, the other at the upper and inner part of the arm. On examining the upper sinus, it was found to run forwards in different directions, so that the pectoral muscle was completely undermined. The lower ran down the arm along the vessels and nerves half-way to the elbow. A large counter-opening was made through the middle of the pectoralis major, and the whole of the granulation tissue was scraped away and a branched drainage tube inserted. The lower sinus was laid open, scraped, and drained. The temperature now went down to normal, and the patient's condition improved. But in a few days suppuration again became active. The sinuses were freely syringed with carbolic lotion (1 in 60), and then daily with boracic acid

lotion. In spite of all that could be done, however, suppuration continued, and a fortnight later it was found that the shoulder-joint had become involved, and was freely suppurating. Three weeks later I removed the arm at the shoulder-joint. At the operation it could be seen that the whole area of the axilla, and the space between the neighbouring muscles for a considerable distance, was one large suppurating cavity. The walls of this cavity and of its recesses were scraped, and as far as possible disinfected, and the shoulder-joint was freely treated in a similar way. The patient improved for a time, but he was pale and weak, and his powers of repair seemed to be exhausted. Albumen was found in the urine, no doubt from lardaceous disease, and he died two months later.

Sub-Gluteal Abscess.—In past years I have met with four cases of death from exhaustion resulting from suppuration beneath the gluteus maximus, followed, when the abscess was opened, by septic infection. Two of these may be briefly related. A man aged thirty-eight had an abscess beneath the gluteus maximus, apparently tuberculous in origin. This was opened at the lower border of the muscle. The operation was followed by general illness and a temperature of 102° , together with a large daily discharge of pus. On his admission a few days later, the cause of suppuration was not apparent, for the hip-joint was quite normal, as were also, as far as could be ascertained, the sacro-iliac joint and the spine. It seemed most probable that suppuration was due to a primary deposit of tubercle in the soft structures. This view was confirmed by another

part of the case, which I think is sufficiently interesting to claim a passing notice. A few weeks later the inner half of the right clavicle became the seat of a fusiform swelling, the shape and steady increase of which raised the suspicion that it might be a new growth. This suspicion was increased when the clavicle suddenly broke while the patient was in the act of raising himself on his elbow in bed. Believing that the bone was involved in a sarcoma, I cut down upon it for the purpose of removing its inner two-thirds. I then, however, found that it was the seat of osteitis, which had so softened it that it had snapped across. Spontaneous fracture of the shaft of one of the long bones, as the result of tuberculous disease, is met with from time to time, but it is certainly rare. I have myself seen it only on four occasions. Once in the tibia, once in the ulna—both in children; in another case, as mentioned at page 107, the second rib, in a case of phthisis, broke during a fit of coughing. The present is the fourth case. So much stress is usually, and justly, laid on spontaneous fracture of a long bone as evidence of new growth that these instances may be mentioned as a reminder that, occasionally at all events, tuberculous osteitis may produce the same result.

But to return to the case of sub-gluteal abscess. After it had been scraped, and, as far as possible, rendered aseptic, the abscess in the course of a month almost healed; but then there was a renewal of suppuration, and an evening temperature of 101° . This state of things continued, and he lost ground, quickly wasted, and finally died of exhaustion three months afterwards. It will be enough to briefly

record one further case. A man, aged twenty-six, was admitted some ten years ago with a large abscess under the gluteus maximus, extending downwards beneath the fascia lata on the outer side of the thigh, and due to disease of the sacro-iliac joint. About a pint of pus was evacuated by an incision through the gluteus towards its lower part. The cavity was found to extend upwards nearly to the iliac crest. A drainage tube was passed in this direction, and a counter-incision was made through the fascia lata in the middle third of the thigh. Great difficulty, however, was found in draining this large cavity through a healthy and so thick a muscle as the gluteus. Pus collected at different parts, and further openings were necessary. The patient ultimately died. From my experience of these examples, I should be inclined in any future case to lay the sub-gluteal space freely open by an incision in the direction of the muscular fibres, clear the cavity, and then pack it with aseptic gauze, and allow it to fill up by granulation. Great care would be essential to avoid sepsis, especially during the action of the bowels. An extra covering of blue wool should on each such occasion be applied over the dressings already in use; some strong disinfectant should be placed in the bed-pan. Afterwards the dressings should be removed, and the whole wound should be syringed out with weak carbolic lotion or weak perchloride lotion, and be re-dressed. The patient in the later stages of healing may with advantage spend much of his time in the prone position. Different abscesses are amenable to different forms of treatment. In the kind of abscess

I have described—one, that is, which occupies an extensive plane of areolar tissue, and is covered by a healthy muscle—mere incision and scraping, and either immediate closure or drainage, followed by aseptic dressing, may not suffice. The cavity must be exposed and left to heal by granulation under strict aseptic safeguards.

Post-Mammary Abscess.—An abscess, the cavity of which, after it has been freely opened, may close very slowly, is that which is termed post-mammary, and which is situated between the back of the breast, and the thoracic wall and the pectoralis major. Here, as in the sub-pectoral and sub-gluteal forms, supuration occurs in a plane of areolar tissue overlaid by a firm structure, which shuts it down, and beneath which it can burrow widely in a horizontal direction. In former times, when septic infection almost invariably occurred, an abscess behind the breast was followed by wide burrowing over the thoracic wall and the development of pockets and sinuses which remained for many weeks, or even months, showing no tendency to heal. I remember two cases in which, in order to get at and expose the various ramifications which had been formed—all other means having failed—the breast was amputated. In another case healing was delayed for nine months. When a post-mammary abscess is originally opened, needless to say under strict asepsis, an incision should be made two and a half inches in length along the inferior crescent of the gland. The gland should then be raised so that all parts of the abscess cavity can be examined, and any pockets detected, freely opened, cleared, and irrigated, and then lightly filled

with iodoform gauze, which has been soaked for twenty-four hours in a solution of one in forty carbolic acid in sterilised water. The main cavity should be lightly packed in a similar manner. Thus managed, these abscesses heal without delay. The arm in the meantime should be bandaged across the chest, so as to keep the pectoral muscle at rest.

Chronic Sub-Periosteal Abscess.—If they are not opened early, abscesses under the periosteum may be attended with grave consequences. One is, that pus retained beneath the periosteum, which has become thickened by inflammation, may burrow along a narrow track for some distance, and at length make its way into one of the joints. This very serious result took place in the following case :—A boy aged fourteen was admitted into the Hospital three years ago with a small abscess on the external aspect of the thigh, about five inches below the great trochanter. When opened, it was found to be under the periosteum of the femur. The outer surface of the bone could be felt to be bare and rough over an area an inch long and half an inch wide. The cavity was cleared of granulation tissue, the wound healed within a fortnight, and the boy was discharged. Three weeks later he was brought to the Hospital again, evidently suffering severe pain in the corresponding hip-joint (which had previously been perfectly sound), and with a temperature of 103° and marked general illness. The limb was flexed on the pelvis, and any movement of the joint was very painful. Investigation showed that the original abscess had refilled, and that burrowing had taken place into the hip-joint, which, when opened by an

anterior incision, passing between the tensor fasciæ femoris and the sartorius, was found distended with pus. The patient said that he had, though with some pain in the seat of the original abscess, been walking freely on the limb until two days before, when he was quite suddenly attacked with great pain in the joint and inability to stand. A few days after his re-admission, in the hope of diminishing suppuration, and in order to secure better drainage and an opportunity of irrigating the joint, I removed the head of the femur. The boy, however, continued to lose ground, and died of exhaustion within two months. His parents declined to allow amputation of the limb. The passage under the periosteum, by which pus had burrowed into the joint, was not larger than an ordinary cedar pencil, but it was no less than five inches in length.

Ossification of Displaced Periosteum.—A boy, aged sixteen, a patient of Dr. Uhthoff, of Brighton, had a swelling in his right iliac fossa, which had been gradually developed in the course of about three months. This swelling, which was at first deeply placed, now filled up the whole fossa, and projected forwards, so that its wide and low-crowned summit was nearly on a level with the anterior iliac spine. It was everywhere hard and unyielding, and presented the general appearance of a large periosteal sarcoma. On two occasions, before I saw the case, and when an exploring needle had been introduced, its point had been arrested by coming in contact with what appeared to be either bone or a hard osteo-sarcoma. As it was important to set any possible doubt as to its nature at rest, the swelling was explored through

a long incision. On dividing the iliacus, by which it was covered, longitudinally, I found this muscle perfectly healthy. The swelling itself, when exposed, was of bony hardness, and at first no evidences of inflammation were to be seen, and the fear that the case was one of sarcoma seemed converted almost into a certainty. On extending the incision in an upward direction, however, in order to completely expose the whole anterior aspect of the swelling, as a preliminary to cutting into its interior, I noticed that, close to the iliac crest, about two inches behind the anterior spine, the iliac muscle was matted and adherent, and of a tawny colour, while a further search disclosed some granulation tissue. Through this a curved director passed into what seemed a large cavity, from which about three ounces of pus escaped. Through this opening, when it had been enlarged, the finger passed into the hollow of the ilium, the ventral aspect of which could be distinctly felt, and by turning the tip of the finger forwards, that is, towards the anterior abdominal wall, a plate of bone was encountered which made a complete dome to about the external half of the fossa, and it was this arched roof which formed the front boundary of the abscess. The explanation of this condition seemed clearly to be that in the first place a collection of matter had formed in the iliac fossa between the bone and the periosteum, constituting a sub-periosteal abscess, so that the membrane had been separated and raised into a kind of tentorium, and that while it was maintained in this position by pus collected beneath it, it had, by virtue of its osteogenetic

function, undergone ossification. It is a noteworthy fact that the formation of this abscess had been unattended with pain, or with tenderness on even firm pressure. The absence of pain, it is easy to understand, was due to the fact that the abscess, which was probably tuberculous, had formed slowly, and had never become tense; further, there was no tenderness on pressure because the parts superficial to the bony shell were quite normal, while the abscess beneath this shell was so completely protected that external pressure was not transmitted to it. The cavity was drained and irrigated daily, and strict asepsis was maintained. Favourable healing occurred, though a sinus remained for several weeks; but this at length closed. The boy has long been quite well, and takes active exercise, including hunting, without any restriction. It is interesting to remark that the swelling has entirely disappeared, so that the iliac fossa has regained its normal depth and hollow shape. Thus, evidently, the bone deposited in the displaced periosteum has, like the temporary or provisional callus around a fracture, been completely absorbed, and the periosteum has regained its normal position.

Ossification of the deep layer of the periosteum, when it has been raised by the collection of matter beneath it, is an event the possibility of which it is necessary to bear in mind in cases of obscure swellings in connection with the bones in childhood. It is well known that in infantile scurvy, when hæmorrhage has occurred under the periosteum of the femur, for instance, the swelling often disappears quickly, the effused blood undergoing rapid absorption.

Swelling sometimes, however, is more persistent, and may feel as hard as bone. In these cases, as in the case related above, it seems not unlikely that bone is deposited in the displaced periosteum. Afterwards it is, like temporary callus, gradually absorbed.

Specimen No. 39A in the St. Bartholomew's Hospital Museum (Figs. 14 and 15) is a remarkable example of ossification of the periosteum of the femur after it had been separated, for nearly half the length of

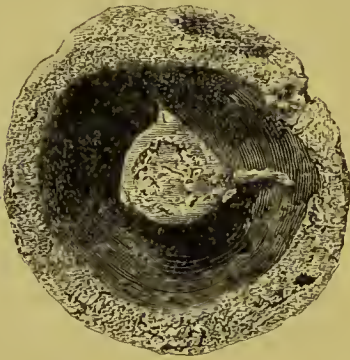


FIG. 14.

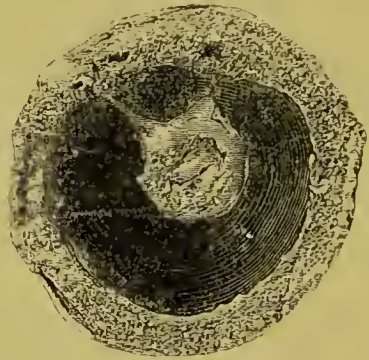


FIG. 15.

Ossification of the periosteum of the femur after it had been separated from the shaft by matter collected beneath it. Lent by the Pathological Society.

the bone, by the formation of pus beneath it, as the result of acute infective periostitis, of about a month's duration, in an infant one year old. The bone has been sawn across just above the condyles. The periosteum for some distance is expanded like an open umbrella or an egg-cup. Thus distended, it has undergone ossification, and through the bony cavity thus formed the original shaft of the femur passes like a central stem. The child died of intercur-

rent bronchitis. The specimen was presented by Mr. Bowlby.

Carcinoma of the Sigmoid Flexure of the Colon imitating Iliac Abscess.—A lady aged fifty-one had a swelling in the left iliac fossa, which had been noticed about three months, and which was gradually increasing. It occupied the usual position of an iliac abscess, such as might depend on Pott's disease of the spine, and presented the same kind of elasticity that is present in an abscess covered by some thickness of soft parts. The patient complained of very little pain, except when an attempt was made to extend the limb, which she kept habitually somewhat flexed. Her evening temperature was 102.3° . No spinal disease could be detected. On examination, this swelling presented all the usual symptoms of an abscess, while the temperature in the morning was usually 101° , and that in the evening between 102° and 103.5° . Yet a suspicion was entertained that the swelling might prove to be a new growth, partly on account of the patient's age, and the apparent absence of any condition on which an abscess might depend; and partly because, as all who have had much experience in the diagnosis of abscesses are well aware, the physical symptoms are sometimes very deceptive. It was therefore determined to perform an exploratory operation. When this was done the swelling was found to be malignant. The patient died a few weeks later, and, on post-mortem examination, the growth proved to be carcinoma, originating in the large intestine, where it lay on the brim of the pelvis. In this case the temperature differed, it will be noticed,

in no way from the temperature observed in cases in which suppuration is present. Such a temperature, together with the physical characters of the swelling, rendered the case in the highest degree deceptive.* Another remarkable circumstance connected with the disease was, that although the growth originated in the wall of the bowel, it never produced any intestinal symptoms, the bowels acting regularly throughout, and at no time was there any griping, vomiting, or distension.

Sinus in the Cheek depending on an Unsound Wisdom Tooth.—A boy aged sixteen had been subject for five months to the occasional formation of a small abscess in the cheek, a little in front and below the orifice of the parotid duct. This abscess, appearing first as a small induration in the substance of the cheek, and then gradually enlarging and discharging a drop or two of pus, seemed for a time to have soundly healed. In the course of three or four weeks, however, the swelling recurred, a drop or two of pus escaped, and the trouble quieted down again. This succession of events had taken place several times. On very careful examination, nothing could be felt beside the indurated swelling, which was not bigger than a large pea. The exact origin of the swelling appeared uncertain. It was thought that it might be tuberculous. On the next occasion of its enlarging, and before the pus had been discharged, I cut into the swelling and searched its floor with a fine probe. The probe readily passed horizontally backwards for a distance of nearly two inches, until it came into contact with the wisdom tooth of the upper jaw on

* But see p. 246.

that side. This was found to be carious and was removed. The sinus then quickly healed. When it was found that the track led back to the tooth, the cheek was very carefully searched for any line of induration. None, however, could be detected, and the cheek between the swelling and the wisdom tooth, on palpation, appeared to be quite healthy. This case afforded a very clear illustration of the fact that when there is a relapsing swelling going on to suppuration, some source of irritation—generally connected with bone—is present, though its exact nature may be very obscure : and that no treatment will succeed until this irritation has been traced to its source, and its cause detected and removed.

Punctured Wound extending through the Ischio-Rectal Space into the Pelvis—Suppuration and Burrowing of Matter through the Obturator Foramen into the Adductor Region of the Thigh on both sides.—A man aged thirty-two was admitted into the Hospital, having fallen on the end of a strong stake, which had passed by the side of the rectum up into the pelvis for several inches. Severe hæmorrhage had occurred, and was arrested only by firm plugging of the wound. Suppuration followed, but after continuing for several weeks, almost ceased. A few days later the patient complained of pain in the hypogastric region, and an indurated swelling was discovered through the abdominal wall on the right side of the bladder. This swelling was followed by the development of an abscess in the corresponding adductor region of the thigh. When the abscess was opened, a long probe introduced into its cavity passed into the pelvis through the obturator foramen.

The abscess, after discharging for about a week, closed and remained soundly healed. A little later an abscess made its appearance in the adductor region of the left thigh, in a position exactly similar to that occupied by the abscess on the right side. This was opened, and when a probe was passed into its cavity it ran through the obturator foramen and into the pelvis in exactly the same manner as had been observed on the right side. This abscess also closed, and the patient made a good recovery. It seemed clear that, following the injury, suppuration occurred around the bladder, and that pus found its way, first on the right side and then on the left, along the obturator nerve and artery, and so passed through the obturator opening into the adductor region of the thigh.

ON DISPLACEMENTS AND INJURIES OF MUSCLES AND TENDONS.

MANY instances of displacement of muscles, or—to speak more accurately—of their tendons, have been recorded.* The clearest, as well as the most familiar examples are displacement of the tendon of the peroneus longus to the front of the external, and of the tendon of the tibialis posticus to the front of the internal malleolus; and of the long tendon of the biceps inwards or outwards from the bicipital groove of the humerus. This accident to muscles, however, is rare. Many muscles are not liable to its occurrence. This is the case with all such as act in a straight line, and do not pass over any bony prominence—the coraco-brachialis, brachialis anticus, palmaris longus, crureus, soleus, and many others. The muscles open to this liability may be grouped under the following headings.

(a) Those, which, at some part of their course, have their tendons suddenly or considerably deflected, and which, as they pass round some bony prominence that serves them for a pulley, lie

* The earliest reference to this subject with which I am acquainted is by William Cowper (*"Myotomia Reformata,"* p. 75, 1724), who relates a case of displacement of the long tendon of the biceps. Pouteau also refers to it (*"Mélanges de Chirurgie,"* p. 417, 1760).

in a groove bridged over by a ligamentous expansion. This is well seen in the case of the peroneus longus and the tibialis posticus as they pass behind the malleoli. If, while the foot is either inverted (Fig. 16) or pointed straight forwards, the peroneus

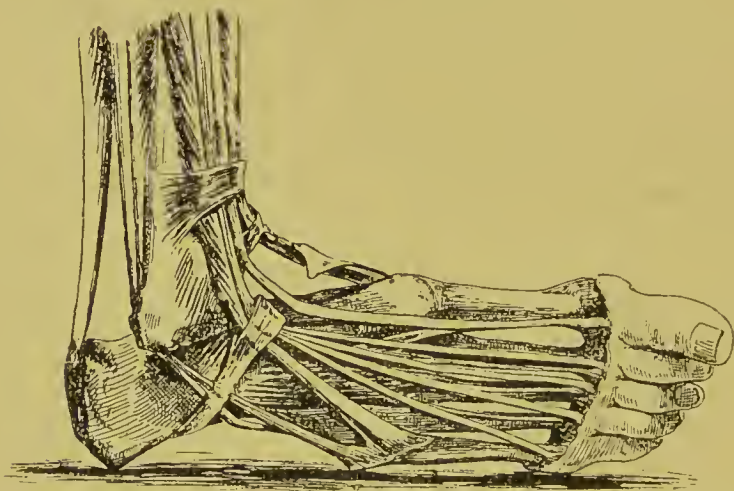


FIG. 16.—Showing that during inversion of the foot the tendon of the peroneus longus is securely fixed in the groove at the back of the external malleolus of the fibula.

longus contracts it cannot slip, for its tendon is drawn tightly into the bottom of the groove at the back of the external malleolus; but when the foot is everted, the peroneus has a tendency to leave its groove (Fig. 17), so that its sheath becomes its pulley, and this, if the strain is severe, may give way.

CASE I.—In Mr. Curling's well-known case, as a man, aged twenty-one, was taking a jump, his left foot slipped on a stone and was turned outwards. On taking off his boot he found a cord on the outer and front part of his ankle. This he replaced himself with instantaneous relief.

CASE II.—Monteggia* reports the case of a young man who dislocated both lateral peronei (longus and brevis) while dancing. They were easily replaced but did not remain in position; they used to slip in and out but without pain.

CASE III.—Benoit, a friend of Broca's,† knew a dancing-master whose peronei habitually slipped, but their condition did not prevent him from

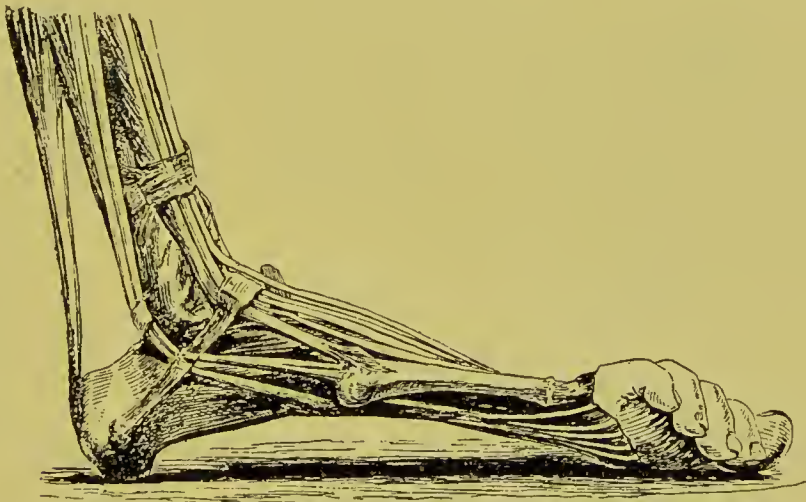


FIG. 17.—Showing that when the foot is everted the tendon of the peroneus leaves its bony groove at the back of the external malleolus and is then kept in place merely by its fibrous sheath.

following his profession. In dancing the foot would be everted. Both Robert and Legouest‡ report cases in which the peroneus longus and peroneus brevis were displaced.

CASE IV.—One of the Sisters of the Hospital, on leaving an omnibus, twisted her right foot and fell. It was found that the tendon of the peroneus

* *Istituzioni Chirurgiche*, Part II., 1820.

† *Bull. de l'Acad. de Méd.*, p. 11, 1874.

‡ *Gaz. des Hôpitaux*, p. 389, 1847, and *Gaz. des Hôpitaux*, p. 191, 1868.

longus had become displaced, and was lying on the front of the fibula. The tendon was easily replaced. Considerable extravasation of blood and swelling followed. The foot was placed nearly at a right angle with the leg, and turned somewhat inwards, so that the tendon lay at the bottom of the groove behind the malleolus, and a leather splint was applied. The foot was kept in this position for three weeks. The splint was then removed, and passive movements and massage were cautiously used for a fortnight. At the end of eight weeks after the injury the patient was allowed to walk. At the present time, two years after the accident, she is freely walking on the limb, and the tendon remains in place.

If the foot instead of being everted is inverted (Fig. 18), and a strain is thrown upon it, it is the tibialis posticus that is in danger of displacement, for in this position the tendon escapes from its groove and pulls directly upon its sheath.

CASE V.—In the *Bull. de l'Acad. de Méd.*, January 6th, 1874, M. Charles Martins has described the manner in which dislocation of the tendon of the tibialis posticus to the front of the internal malleolus happened in his own person.

M. Martins was in a balloon, which in its descent bumped violently upon the ground. Finding that he was being turned heels over head backward he forcibly extended his foot in order to right himself. He experienced a sudden pain, and afterwards found that the tendon had been displaced to the front of the malleolus.

There is a particular muscle which, from its

deflected course, would appear at first sight to be peculiarly liable to displacement. This is the extensor longus digitorum (pedis). When the foot is inverted this muscle takes the direction shown in Fig. 16.* Yet so far as I know, no example of its displacement has ever been recorded. The explanation of its immunity from this accident is clear when the structure of the anterior annular ligament is

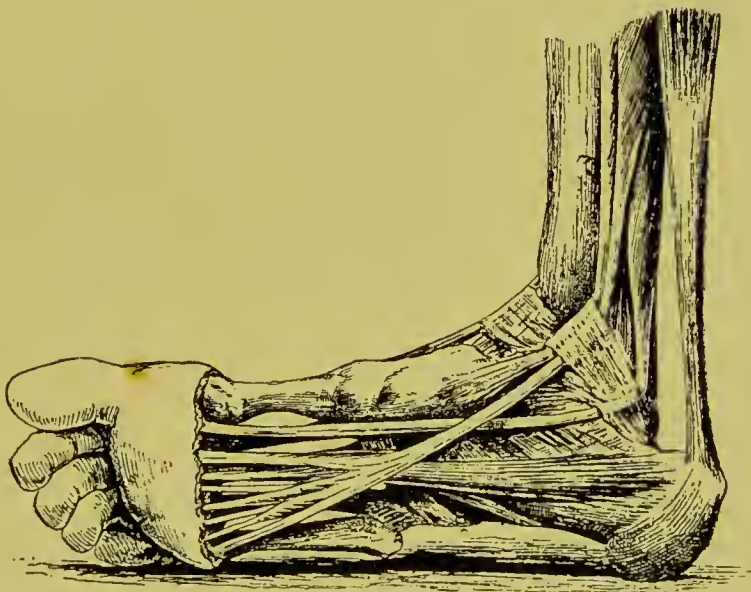


FIG. 18.—Showing that when the foot is strongly inverted the tendon of the tibialis posticus leaves its groove at the back of the internal malleolus of the tibia, so that the strain of maintaining it in position falls entirely upon its fibrous sheath.

taken into account. It will be remembered that this ligament is Y-shaped, and that the stem forms a loop through which the tendons of the extensor pass. It is this loop (Fig. 16) which binds down and serves as a pulley for the muscle, and effectually prevents it from “straightening out,” no matter how

* The inversion may be so violent that the fleshy part of the extensor brevis digitorum is ruptured.

much the foot is inverted or how forcibly the muscle acts. Mr. Waring, Lecturer on Anatomy at St. Bartholomew's Hospital, finds that the breaking-strain of this loop is about 112 lbs.

(b) Those which pass over bony prominences that undergo considerable subjacent movement to one side or other of the line of the tendon. This is well illustrated by the long tendon of the biceps cubiti. Thus William Cowper* relates that a woman, while wringing linen, felt something displace itself at her shoulder. Three days afterwards the surgeon noticed a depression at the outer part of the deltoid, a rigidity in the lower part of biceps, and an impossibility to extend the forearm. Next day Cooper manipulated the arm in various directions, the tendon slipped back into place, and the patient at once recovered the use of her arm. In the act of wringing clothes, the upper end of the humerus would be strongly rotated outwards, and during this movement the bite of the tendon would be at first upon the inner border of the bicipital groove, where it is formed by the lesser tuberosity; but as the bone turned still further outwards, the strain would fall entirely on the strong aponeurotic expansion (derived from the insertion of the pectoralis major), which converts the groove into a tunnel. Rupture of this expansion would be followed by displacement of the tendon,

Monteggia † reports the case of an old lady who was constantly subject to dislocation of the long tendon of the biceps. When she felt it go out, she

* *Loc. cit.*

† *Istituzioni Chirurg.*, Part II., p. 334, 1803.

put her hand on the shoulder of another person, and rotated the limb, and this movement restored the tendon to its place.

(c) Those that slip over some bony ridge or projection. A case that will serve as an illustration is recorded by Pouteau* (Case VI.). A girl who was leaning out of a window, suddenly turned her head to look upwards and to the right. She felt acute pain, and found that her head was drawn down towards the right shoulder and fixed in that position. Pouteau, believing that a bundle of the splenius had slipped, relaxed this muscle, and manipulated the part. While this was being done, the patient felt a jerk, the pain at once ceased, and free movement was regained. The following very similar case was under notice in the out-patient room of St. Bartholomew's Hospital in 1886.

CASE VII.—A boy, aged nineteen, while vigorously washing his face and neck, felt a sudden pain in the side of his neck, and found that he could not move his head. When he came to the Hospital three hours afterwards, he presented the appearance of a person with a wry neck, and any attempt at movement was very painful. He inhaled gas, and his muscles were kneaded where he had previously indicated that he felt the pain, and his head was placed in position. When he regained consciousness, all his symptoms had disappeared. In both these instances it seems highly probable that a tendon of one of the deep muscles approaching its insertion, had slipped over the apex of the posterior tubercle of the transverse process of one of the cervical vertebræ.

* *Loc. cit.*

I mentioned this case to a surgical class, which Mr. Earle Newton, F.R.C.S., now practising at Perth, Western Australia, was attending. Mr. Newton recently sent me the following note :

CASE VIII.—“ A few days ago a jockey, while riding a race, turned his head to the left to see how far he was leading. He felt a snap in his neck, attended with sharp pain shooting upwards towards his ear and downwards over his shoulder of that side. His head remained turned towards his left shoulder, and when he tried to turn it to the right, pain was severe. My partner gave him an anæsthetic, and I manipulated his head, and exerted slight extension. A slight click was felt, and his head came into position. When he became conscious he turned his head round and exclaimed, ‘ By Jove, it’s all right now.’ ”

CASE IX.—A man, aged twenty-three, came to the Hospital with his head fixed and turned to the left side. He said the condition had suddenly developed when, a few hours before, he had quickly turned his head. The symptoms exactly corresponded with those of the cases first related. When, however, I advised him to take ether and have his head moved, he declined treatment and left the Hospital.

CASE X.—A young cavalry officer, much given to athletics, when he raised his left arm suddenly to a right angle with the trunk, as for instance to protect his face when he was taking a fence while hunting, had severe pain at the insertion of the deltoid, and found that the arm was fixed and powerless. On moving and rubbing the part, the symptoms disappeared, but the arm over the lower part of the deltoid was tender on pressure for two

or three days. Two years later, the right arm was affected in an exactly similar way, and the symptoms recurred so frequently that it became likely he would have to leave the service. It was impossible to say on what this condition depended, but it seemed probable that the deltoid ridge had become irregularly hypertrophied, and that there was some outgrowth or projection over which part of the tendon slipped.

I have elsewhere recorded a case* in which the symptoms observed could best be explained by the view that one of the four or five tendons which lie on the deep aspect of the obturator internus muscle as it passes out of the lesser sacro-sciatic foramen had slipped over one of the ridges by which the bone is often marked in this situation.

I have met with four instances in which, with each movement of the fingers from extension to flexion and flexion to extension, one of the tendons of the extensor communis digitorum slipped out and in over the subjacent knuckle. The tendon of the popliteus appears to be subject to displacement. It will be remembered that during flexion this tendon lies in a well-marked groove on the external condyle of the femur, which it leaves when the limb is extended. In osteo-arthritis the condyle of the femur in the neighbourhood of this groove, as elsewhere, may become "lipped," so that the edge of the articular cartilage is heaped up into irregular prominences, and over one of these the tendon may slip. I have never seen this condition demonstrated by dissection, but cases have presented themselves

* "Diseases of the Joints and Spine," 1895, p. 235.

in which the knee was locked against extension by some impediment at the back of the joint in the course of the popliteus tendon, and in which the "lock" disappeared when the leg was flexed upon the thigh, rotated inwards and outwards, and then fully extended. I believe that some instances, although they must certainly be rare, of "internal derangement of the knee-joint" are due to this dislocation of the popliteus tendon.

Among other muscles the displacement of which has been recorded, are the triceps cubiti, pronator teres, rectus femoris, sartorius, plantaris, and slips of the erector spinæ, as in an instance related by Callender.

Symptoms.—The symptoms of dislocation of a muscle are sometimes obvious, as in the case of the peroneus longus, the tibialis posticus, and the extensor communis digitorum of the fingers. Here the tendons can be both seen and felt close beneath the skin. Sometimes the diagnosis rests on indirect yet pretty clear evidence. Thus, in the case of the woman who was wringing linen, dislocation of the tendon of the biceps was indicated by the patient's sensation of a sudden slip near the head of the humerus, rigidity of the lower part of the biceps, fixation of the forearm in a flexed position, the impossibility of extending the forearm; and also by the fact that she was executing a movement at the time by which it seemed not unlikely that the accident might be produced. In the two cases of displacement of muscles in the neck, the evidence, while it seemed tolerably conclusive, was yet indirect in character.

In a third group the diagnosis of muscular displacement may be impossible, and the surgeon will be able to get no further than a suspicion that a displacement of some kind has occurred. In the case of what I believe to have been displacement of one of the tendinous subdivisions of the obturator internus in a boy aged fourteen (*supra*), the limb was slightly flexed, abducted, and rotated outwards; there was pain, together with tenderness on pressure over the ilium, just above and internal to the great trochanter, and lameness. The view I originally formed of the case was that there was some tuberculous mischief involving the ilium in the neighbourhood of the external rotators. All the symptoms, however, disappeared when the limb was manipulated by a bone-setter, who said "a bone was out." This imaginary bone he located four inches down the thigh, in a line with the anterior iliac spine. A year later the boy, on suddenly rising from the sitting position, was seized with sharp pain at the back of the ilium, and the limb was fixed in the same position as before, and was now the seat of painful muscular spasms and tremors. On this second occasion the sudden onset of the symptoms following the act of rising, the fixed condition of the limb, and the spasmodic state of the muscles could, perhaps, best be explained by some muscular displacement, but such a view could scarcely have been more than a suspicion. However, having heard what had already taken place, I manipulated the limb under gas, and the symptoms at once disappeared.

The history may be of great assistance in this group of cases. It was the knowledge that the

trouble had followed a sudden change of posture and that similar symptoms had on a previous occasion been relieved by manipulation, which afforded a strong suggestion as to the treatment that should be adopted.

Treatment.—Reduction is easily effected by manipulation after the part has been placed in such a position that the muscle concerned is relaxed. In Case VII. the head was turned down towards the shoulder and rotated to the same side, and then the muscles at the seat of pain were kneaded and rolled backwards and forwards under firm pressure beneath the fingers.

In cases of mere displacement, unaccompanied by laceration of the retaining sheath, no treatment beyond reduction will be required. But when laceration of the sheath has occurred, after-treatment to prevent recurrence is of the highest importance, the more so because cases which are on record show that if adequate treatment is at once adopted, complete repair may be secured. As soon—in the case, for instance, of the peroneus longus—as the displacement has been reduced the foot should be placed at a right angle with the leg and somewhat inverted, and be enclosed for three weeks in a leather splint or in plaster-of-Paris (Case IV.). In this position the tendon will lie secure from any liability to displacement at the bottom of its groove, and the torn edges of the sheath will have the best chance of falling together, while the inflammatory exudation which follows the injury, undergoing organisation, will, it may reasonably be expected, either produce union of the torn sheath or develop a new one. That a new

sheath may be thus developed is proved by a case recorded by Stanley,* who in the dissecting-room found the long tendon of the biceps dislocated out of its groove and lying on the top of the greater tuberosity of the humerus. A membranous sheath fixed to the bone and surrounding the tendon maintained it in its new position. This sheath was smooth and polished on its internal surface, and gave free play to the tendon.

In the case of C. Martins, of dislocation of the tibialis posticus, the leg, after the reduction of the tendon, was placed in a silicate bandage. The foot was not put to the ground for two months. At the end of three months, he could walk without pain, when the ankle was supported with a bandage. He believed that no adhesions between the sheath and the tendon had been formed, and that synovial secretion had not been interfered with. Jarjavay met with a case of dislocation of the peroneus longus in which recovery took place in a month, the foot during this time having been retained in a rigid bandage. Gosselin, in a case of dislocation of the peroneus, endeavoured to produce inflammation by allowing the tendon to slip in and out for a few days, with the view of securing adhesions. In the case so treated, the patient walked well without any support and without a limp in six weeks. Many, I think, will doubt the advisability of endeavouring to promote inflammation in these cases, and I should myself doubt very much whether it contributed in Gosselin's case to the successful result, seeing that in other instances not so treated recovery has been met with.

* *Lond. Med. Gaz.*, vol. iii. p. 12, 1829.

Here the question presents itself whether, in a recent case, the lacerated sheath should be exposed and sutured. As to this, I have no experience to offer, nor do I know of any instance in which the operation has been performed. That repair may take place without it is shown by published cases. Whether or not the proceeding is advisable cannot, I think, be decided till further experience is obtained as to the results of treating cases by fixation in an appropriate position of the limb. Should it prove that the results of the latter method are unsatisfactory, immediate suture, which would involve no risk when performed aseptically, would be clearly indicated.

A drawback that some might anticipate after suture would be the development of adhesions between the tendon and its sheath. But if these formed they would at all events keep the tendon in place, and at the worst they could only embarrass or prevent the action of a single muscle which was already out of gear. If, however, the operation is aseptic, no adhesions are likely to form. When tendons which have been cut in accidental wounds are sutured either immediately or after some time has elapsed, adhesions do not form unless suppuration occurs.

And clear evidence upon the question of the development of adhesions as the result of an operation is obtained from the following case: A young lady aged 19, who was training as a professional pianist, said that she could not use her left hand. On examination it was found that she had a bony outgrowth from the lower end of the radius beneath the radial extensors, which interfered with the movements

of their tendons. In the operation for its removal it was necessary to divide the posterior annular ligament of the wrist, and displace the tendons of the extensor secundi internodii pollicis and the extensor carpi radialis longior and brevior. Although this was done, and although after the growth was removed the tendon-sheaths were left resting on the exposed cancellous tissue of the radius, primary union occurred and absolutely unimpaired movement of the wrist and thumb was preserved.

In cases of long standing, in which the recurrence of displacement, for instance of the peroneus longus, was a frequent source of pain and considerable interference with the use of the part, and in which less radical measures, including suture, carefully tried, had all failed, the best course would probably be to throw the muscle entirely out of action by resecting so much of its tendon as would ensure the permanent separation to its ends. The patient after such a proceeding would no doubt have lost an important muscle, but it would be one whose functional activity had already been destroyed.

Rupture of Muscles.—The following remarks have no allusion to the laceration of muscles which is produced by external injury, or which occurs in tetanus or during parturition. They refer only to the rupture of single muscles by their own forcible contraction during ordinary movements. It is well known that the nervous system can stimulate a muscle to such a forcible contraction that the muscle either tears itself or its tendon, or fractures the bone upon which it is acting; which of the two structures—the muscle or the bone—will give way depends

upon various circumstances. In the case of the quadriceps extensor femoris *versus* the patella, it is probably often a question of the position of the limb at the time. If when the breaking-strain is applied the limb is flexed (the usual case) the patella, which is subjected to leverage of the first order, fractures transversely; while, if the limb is extended, either the quadriceps tendon or the fleshy substance of the muscle higher up in the thigh will be ruptured.* Sometimes the bone concerned is much weaker than the muscle: thus the tip of the internal condyle, while it is still an epiphysis, may be detached by the vigorous action of the muscles arising from it. Sometimes part only of a muscle is thrown into sudden action, and, taken at this disadvantage, it gives way. Among athletes the partial rupture of a muscle under such circumstances is a frequent accident.

Rupture most commonly involves the tendo Achillis, or some part of the muscular substance of the calf, the quadriceps extensor, or the adductors of the thigh, or the biceps of the arm; but it is not rarely met with in the rectus and other muscles of the abdominal wall. Less frequently it involves the deltoid, the pectoralis major, and the muscles of the back or of the forearm. It would be useless as well as tedious to describe cases of ruptured muscles or of their tendons in any detail, but the following examples may be briefly related.

CASE I.—A lady, while skating, ruptured her tendo Achillis, but continued to walk upon the limb, and for some months attended regularly at a gymna-

* Rupture of the ligamentum patellæ is noticed later on.

sium.* When I first saw her, nine months afterwards, corresponding to the lowermost three inches of the tendo Achillis was an elongated elastic swelling about twice the normal size of the tendon, and evidently containing fluid. As the patient was not improving, and as the limb was very weak and the calf muscles were much wasted, the swelling was explored through a longitudinal incision. About two drachms of clear amber-coloured serum escaped from an elongated cavity containing the tendon. The tendon had been ruptured, and was still completely ununited. The upper end had become retracted. The lower end, about two inches long, was necrosed and shrivelled, and from long maceration in the serum mentioned above, presented the appearance of wet chamois leather. Below, it was still attached to the os calcis. The walls of the cavity were thick and formed of condensed cicatricial tissue. This material was so tough and substantial that it seemed capable of taking the place of the lost tendon. The necrosed piece was therefore cut away, and the edges of the incision into the sheath were

* It may be worth while to allude to the fact that rupture of the tendo Achillis does not prevent a patient from walking on the limb. Unless this is borne in mind the accident may easily be overlooked. A gentleman, aged sixty-six, who ruptured his tendon while stepping into a railway carriage, walked down the platform, a distance of about fifty yards, and went home in a cab. He felt his foot weak, but he was quite unaware that he had met with any material injury, and supposed he had merely sprained his ankle. It was only on careful examination that the injury was discovered. It is well-known that John Hunter ruptured his tendo Achillis. He met with the accident, at the age of 39, when he was dancing. "He did not confine himself to bed, but continued to walk during the cure." He kept the heel raised and compressed the muscle gently with a roller. The result, however, does not seem to favour this method of treatment, as the tendon underwent ossification (Palmer, "Life," p. 34).

brought together longitudinally. Thus the sheath was converted into a cylindrical column, which was about the size of, and felt very much like, a normal Achilles tendon. The wound healed by primary union. After the operation, the new tendon became firm and tolerably strong, and the patient was able to walk with the help of a light steel support. This has now been discarded, and the limb has gradually become much stronger.

A few years ago I had a patient in the hospital who had met with a somewhat unusual accident. One of his fellow workmen threw a small axe at him across the workshop in which they were employed. The axe struck his heel, and cutting through his boot, cut also through the posterior part of his os calcis, so as to entirely detach the tendo Achillis. It was found that on raising the heel the parts came very readily into position. The detached piece of bone united firmly to the rest of the os calcis, and the patient recovered the full use of his limb. Had it seemed necessary, it would have been easy to suture the detached fragment in place.

Rupture of the Ligamentum Patellæ is a rare accident, but many examples are to be found in surgical literature. Recorded cases show that the injury may be produced (1) by muscular action, during a violent effort to escape a fall backwards,* or in the act of jumping, running, or rapid walking; † (2) by a fall in which the limb is forced into extreme flexion under

* Author's case. Blacher, *Gaz. des Hôp.*, 1875, p. 563, *et seq.* Sellier (Blacher, *ibid.*, p. 580).

† Cosmao Dumenz, Thesis, 1865, quoted by Blacher.

the weight of the body ;* (3) by direct violence when the ligament is tense. †

The ligament may be ruptured either completely or, as a few instances show, only partially. It may give way in any part of its length, or it may be detached either from the patella or from the tubercle of the tibia ; or again, a small fragment of either the patella or the tibia may be torn away with it.

The diagnosis of rupture of the ligamentum patellæ is usually easily made. The rupture is generally complete. When this is the case, the patella is drawn upwards considerably above the condyles of the femur—it may be as much as three inches, or even more—a distinct gap can be felt, and the limb is powerless. The injury is usually met with in male subjects during some strong muscular effort, but it may occur even in weakly people when the limb, in a fall, is violently flexed. In incomplete rupture there would be the history of an accident, a powerless condition of the limb, and a gap involving only a part of the tendon. Any considerable displacement of the patella upwards indicates not only that the ligament itself is ruptured, but that the lateral expansions of the vasti also are torn. Generally the laceration extends into the knee-joint. The suture of the ligament therefore usually involves exposure of the joint cavity.

The treatment consists either (*a*) in the use of a back splint to maintain the limb in an extended position and in some means of keeping the patella in place, or (*b*) of suture. In many instances in which the former method has been adopted the results have

* Dumenz, *loc. cit.*

† Blacher, *loc. cit.*

been satisfactory. The patients have been kept in the horizontal position for about two months (this time seems needlessly prolonged : union of the tendon is probably accomplished in a month or five weeks), and have then been allowed to move about, wearing some form of apparatus for a period varying from three to six months. In October of 1898 a man aged twenty-eight was admitted with complete rupture of the ligamentum patellæ. The injury occurred as the result of a violent effort which the patient made to save himself from falling in the street. Mr. Crossman, Senior House-Surgeon, found the patella drawn up the thigh for nearly three inches above its normal level, and a wide and deep gap between its lower end and the tubercle of the tibia. The patella was pushed down into position, and a pad and bandage were applied above it, and the limb was placed on a black splint. As, however, the patella had been considerably displaced upwards at the moment of the accident, and then pushed down again, it seemed highly probable that the upper end of the ligament was rucked up just below the patella, and at such a distance from the lower end that good union could not be expected.

It was therefore determined to cut down on the ligament and suture the ends together. When the ligament was exposed by a median longitudinal incision it was found that it was not simply snapped across, so that it presented two compact square ends. but that it had given way about its middle, piecemeal and obliquely from before backwards and upwards, so that its ends were broken up into numerous separate fibres and shreds of different lengths and

sizes. The knee-joint was widely torn open in front, and contained a good deal of partially coagulated blood. The joint was freely washed out and the two ends of the ligament were brought together by three or four sterilised silk sutures passed transversely through them above and below the points at which they were respectively frayed out. These sutures were drawn only so tight as to secure coaptation. Care was taken to avoid putting any strain on them, as this would have made them cut their way out. The limb was placed on a back splint. The wound healed by primary union. At the end of six weeks the patient was allowed to be up, and was furnished with an appliance such as is worn after fracture of the patella, and so constructed as at first to maintain the limb in a position of full extension, but afterwards to allow a gradually increasing degree of movement. In three months the limb could be completely and strongly extended, and flexed to an angle of about 120 degrees. Full strength and complete movement of the limb were ultimately regained.

Rupture of the Quadriceps Extensor Tendon in the thigh is an accident in regard to both the prognosis and the treatment of which much difference of opinion still exists. Some believe that it is likely to be followed by grave impairment of the functions of the limb, and, as to treatment, that the patient should not be allowed for many months to walk without an apparatus to keep the limb in a position of extension. Such opinions are scarcely borne out by clinical experience. Those seem more correct who hold that favourable recovery is the rule, and that in the generality of

cases the limb may be safely used for careful walking, without support, within about four months after the accident. The following cases confirm this view :

A surgeon, fifty years of age, while walking in the dark on uneven ground, stumbled and ruptured his left quadriceps tendon just above the patella. He lay in bed or on a sofa for six weeks wearing a back splint, and then for two months he walked with a stiff apparatus. After this—that is, in less than four months—he discarded all support and walked about as usual. For a year the limb was somewhat weak and the muscles were atrophied ; but at the end of this time the limb, except for some remaining muscular wasting, was as good as ever, and he told me that he could get in and out of a high dogcart “with considerable agility.”

A gentleman, aged sixty-one, on arriving at the bottom of a flight of stairs, stepped upon a loose mat lying on a polished parquetry floor. The mat slipped, and in spite of a violent effort to support himself, he fell. He was helped up and left standing for a moment with his hands on the mantelpiece, when his limbs suddenly gave way under him, and he fell a second time. On examination it was found that both his quadriceps tendons were ruptured close above the patellæ. He was kept in bed, or on a sofa, wearing back splints, for six weeks, and was then allowed to walk, wearing an apparatus to keep the limbs extended. At the end of three months—that is, fourteen weeks after the accident—he left off the supports, and only used a stick. He met with no drawback, and three years later he could walk five miles easily, and the

limbs were strong and only "gave a little, sometimes."

Whether or not it is advisable to suture the quadriceps tendon when it is ruptured, is a question to which, at present, no definite answer, I think, can be given. No doubt the operation can be performed with safety under due precautions, and the accurate apposition of the two ends of the tendon, which could be effected by suture, would conduce to rapid and firm union. On the other hand, there is ample experience to show that without the operation such good results may occur that the function of the limb is scarcely, if at all, interfered with. Union will take place just as it does when, after rupture of the tendo Achillis, the ends are adjusted by placing the foot in a position of equinus. Wide separation of the ends does not usually occur, for the upper fragment is prevented from extensive retraction by the two vasti, with which it is closely connected, and which skirt it on either side, and are attached by their fascial expansions to the upper end of the tibia and the sides of the patella. The best course at present will be to deal with each case according to circumstances. In a young adult, to whom time is very important, and whose tendon presents a gap of an inch or more, suture will probably be advisable; while in patients upwards of forty, and whose health is in any way or degree impaired, the operation should not be done. Here, as in the case of the ligamentum patellæ, it is to be expected that the synovial membrane will prove to have been lacerated, so that the operation involves opening, and, if blood has been extravasated, washing out of the joint.

Rupture of the Adductor Longus of Both Thighs ; Removal of a Portion of the Right Muscle.—A man, aged twenty, having joined a cavalry regiment, noticed, after some riding-lessons, that his thighs at their upper and inner part were blood-stained, and that, on the right side, a firm swelling projected against the saddle, so that he could not ride. On examination it was found that, on the left side, the adductor longus was partially, and on the right completely, torn across about three inches below its origin from the front of the pubes, and that, when the right muscle contracted, its uppermost three inches protuded abruptly inwards like a rounded stump, close beneath the skin. A few days later this portion of the muscle, which proved to be connected with the part below merely by loose scar tissue, was dissected out. The wound healed by primary union. The piece removed was as well nourished and plump and ruddy as were the neighbouring muscles. Its condition thus contrasted with the atrophy which follows, in some instances at least, after a muscle has been ruptured. Perhaps the absence of degenerative changes was dependent on the circumstance that the rupture had occurred only a few weeks before. It is an interesting fact that, although so large a muscle as the adductor longus had been thrown out of action, the limb seemed, when the patient left the hospital, as strong and useful as ever.

The rectus and other abdominal muscles may be ruptured by violent action at football, in riding, or in the effort to avoid a fall backwards while a heavy weight is being carried. In a football player the left rectus, together with a thin plate of

bone, was torn away from the crest of the pubes. The fragment of bone necrosed and led to an abscess, which burrowed halfway up to the umbilicus, and in the cavity of which it was found. Demoulin* relates a case of rupture of the rectus abdominis in a man who made a violent effort to save himself from falling backwards while he was carrying a sack of potatoes. A large tumour, due to blood extravasation, formed below and to the left of the umbilicus, which a surgeon regarded as a ventral hernia, and for which he advised a truss. In this case the patient was free from discomfort when he was at rest or when he walked in a stooping position, but he had pain when he attempted to walk upright. In another case a surgeon mistook a rupture of the right rectus, attended by a large hæmatoma, for an umbilical hernia, and proceeded to operate upon it.

Janey and Richardson have reported cases in which rupture of the rectus was complicated by laceration of the deep epigastric artery and the formation of a very large effusion of blood.

Boyer records the case of a young man who, in lifting a bucket of water, ruptured his psoas magnus. Suppuration occurred, and the patient died ten days after the accident.

In the upper extremity the biceps appears to be ruptured more frequently than any other muscle. The rupture may involve the short or the long head, or the belly of the muscle formed by the union of the two. Wilson† reports a case of rupture of the biceps of both arms. A man, aged fifty-four, of great

* *L'Union Médicale*, October 7, 1893.

† *Pennsylvanian News*, October 5, 1889.

muscular strength, while fighting, attempted to deliver a blow, but missed his antagonist, and his arm fell useless to his side. Six weeks later he was fighting again, and ruptured his opposite biceps in exactly the same way. When the patient was seen by the author of the paper, both biceps muscles were evidently ruptured in their lowermost third, where in each there was a wide depression. The patient could flex the arms, but the depression was much more marked in this position.

Other muscles liable to this injury are the pectoralis major, the deltoid and the triceps, and probably, from time to time, the various muscles of the forearm. A few years ago I saw a girl, aged eleven, a patient of Dr. Chapple, of Weybridge, who, while at a gymnasium, had ruptured the tendon of the flexor carpi radialis. There was a sausage-shaped swelling in the course of this muscle, and a gap between the lower end of this swelling and the annular ligament. When the patient was asked to flex the hand upon the forearm, no projection in the line of the tendon could be felt; but a well-marked groove, extending for an inch and a half above the annular ligament became more distinct. The functions of the limb were not appreciably impaired. The case deserves to be recorded, for rupture of tendons in children is a rare occurrence.

Symptoms.—These are generally so well marked that if care is used they are not likely to escape notice, but they vary a good deal in different instances. (1) There is often a history of a strenuous muscular effort, but in some instances the force in action seems to be comparatively slight.

The suddenness of the contraction of a muscle which a moment before was in a condition of relaxation, has much to do with the result. The tendo Achillis is sometimes ruptured by so slight a force that the history the patient gives is very apt to mislead. (2) There is, at the moment, sudden pain and a sensation as if the part had been struck, but the pain may be very slight. (3) The snap may be distinctly heard. (4) A gap can usually be felt. (5) When a tendon is ruptured there may be scarcely any swelling at first; later on, some swelling is caused by the effusion of lymph for repair. When a muscle is torn in its fleshy part swelling, due to extravasated blood, is often considerable, and may extend for some distance. Thus in Richardson's case the swelling was large enough to simulate an umbilical hernia. In some cases, for instance when the quadriceps extensor tendon is ruptured, the limb is powerless, but in others, for example when the tendo Achillis is torn, the patient may be able to walk with so little difficulty that the injury is easily overlooked.

Prognosis.—In the large majority of instances prognosis is favourable. Ruptured tendons may undergo perfect repair. This is often so with the tendo Achillis, and recorded cases tell the same in respect to the ligamentum patellæ and the quadriceps tendon of the thigh. Nor is this any matter for surprise. When, in cases of talipes equinus, the tendo Achillis is divided, and the foot is placed within a right angle with the leg, the gap which is left between the ends (often an inch and a half, and sometimes more, in length) is filled up by the

development of a new piece quite as large and as strong as the original tendon. Rupture through the fleshy part of a muscle heals by the development of a fibrous scar by which the ruptured ends are more or less closely approximated. But even when the ends remain separated by a considerable interval the functions of the part may be but slightly or not appreciably impaired. This is the case when the muscle involved is one of a group the other muscles of which can take its place. In the instance (*supra*) in which the upper three inches of the abductor longus were entirely removed, the patient was unconscious of any muscular defect in the limb.

Treatment.—As already said, everyday experience shows—for example in the case of the tendo Achillis—that when a tendon is ruptured, if the limb is kept in such a position that the origin and insertion of the muscle concerned are approximated so that the ends of the tendon are not widely separated, the result is usually good. But whether operative interference is likely to secure a still better result can be determined only by considering the features of each particular case. Two circumstances may justify or even call for operative interference: a wide separation of the ruptured ends which cannot be otherwise corrected; and a considerable extravasation of blood, the presence of which would materially prolong the period occupied by repair. Neither of these two features is usually present in the case of a ruptured tendo Achillis; but they are more likely to be met with in rupture of the quadriceps extensor and the ligamentum patellæ. In the former the

vasti on either side of the tendon are often also torn, so that a good deal of blood is extravasated and the separation of the ends is considerable.

When the fleshy part of a muscle is torn the attempt to unite the ends by suture would be useless, as the stitches would not hold. If, however, a large blood clot is present, and near the surface, it will be advisable to expose the swelling by a free aseptic incision and remove the clot. At the same time any available portions of the sheath of the muscle should be drawn together and sutured. I am not aware that this has been done in the case of the rectus abdominis, but when the rupture is extensive such a proceeding—as this muscle has a strong sheath—might be a material safeguard against subsequent yielding, and the development of a ventral hernia.

A CASE IN WHICH AN AFFECTION OF THE KIDNEY PRESENTED POINTS OF RESEMBLANCE TO THE PHE- NOMENA OBSERVED IN RAY- NAUD'S DISEASE

THE patient, an unmarried woman of twenty-five was originally admitted into St. Bartholomew's Hospital in June 1886, with the symptoms of stone in the left kidney. These were—(a) Pain in the left lumbar region, present since she was thirteen. (b) Very severe paroxysmal exacerbations of this pain, occurring sometimes without obvious cause, but usually provoked by movement. During these attacks, which lasted from an hour to fifteen hours, she sat in a crouching position, or lay on her side with the limbs drawn up. Afterwards she was cold, prostrate, and feeble. (c) Painful and frequent micturition—the urine during the attacks being passed six or seven times in an hour. (d) Pus and blood in the urine.

Believing the kidney contained a stone, I undertook an exploratory operation, using, to gain room, an incision in the mid-axillary line, instead of the usual one further back in the lumbar region. The kidney, however, could nowhere be found. As the symptoms continued, a few weeks later I opened the

abdomen in the middle line, and then easily found the kidney, and I also learnt why I had missed it before. It was very small and freely movable, and had no doubt been carried up with the peritoneum when the deeper parts of the wound were retracted. No stone could be felt: but as the kidney was atrophied and useless, I determined to remove it, after ascertaining that the right was present and apparently healthy.

The patient made a good recovery, and was discharged in September 1886. On examination the kidney was found to contain three very small calculi—about three times the size of a grain of wheat.

The main point that seemed noteworthy in the case, so far, was that such severe symptoms should be connected with an atrophied movable kidney containing only three calculi, so small that they might, as it seemed, have been easily passed.

A month later, however, the patient was readmitted with pain in the right (remaining) kidney and with scanty secretion of urine, but she soon improved, and was discharged in November. In December she was again admitted with severe renal colic, and almost complete suppression of urine. In January 1887 the right kidney was explored from the loin, but nothing was found.

After this the symptoms subsided, and the patient worked as a household servant till the end of December 1889. During this period she was pretty well, but she occasionally suffered with severe pain, hæmaturia, and partial suppression of urine. These symptoms were generally relieved by a hot bath and a few hours' rest in bed. But on January 29, 1890,

she was admitted again, on account of an attack of unusual severity. She had such severe pain that she almost fainted; pulse 130; vomiting and great headache. On February 1 she passed only 11 oz. of urine. The note of February 3 states that she had passed no urine since February 1 till 10.20 A.M. that morning, when she passed 25 oz., sp. gr. 1030, acid, trace of blood. For several days she was in much the same state, passing sometimes a fair amount of urine and complaining of less pain, at other times suffering severely and having almost complete suppression.

February 13.—Very severe pain for several hours; 40 oz. in twenty-four hours.

February 14.—Much less pain; 40 ozs. of normal urine in twenty-four hours.

February 17.—Pain still very severe; 60 oz. in twenty-four hours; no albumen or blood.

March 4.—Has been in much less pain; urine in fair quantity; now has a very severe attack of pain. No urine passed between 12 P.M. on 2nd and 11 P.M. last night (twenty-three hours), then 18 oz. Temp. 102.6°.

March 5.—No urine from 11 P.M., 3rd, to 6.30 this morning; then only 8 oz.

March 11.—Pain severe; 8 oz. in forty-eight hours, loaded with blood. She then passed no urine for twenty-four hours, and then 16 oz. loaded with blood. Sp. gr. 1020. Micturition very difficult and painful.

March 17.—Much better; urine in normal amount, and passed with much less difficulty.

March 27.—After little suffering for ten days, now severe pain, vomiting, and faintness; urine scanty, loaded with blood; micturition painful and difficult.

April 21.—Has been much better; urine gradually became free from blood; passed two small fragments of calculous substance.

April 29.—Severe pain with vomiting. No urine for thirty hours.

May 29.—Has been more free from attacks; complains of much headache. Temp. 101° to 102° .

June 23.—Still pretty well; but on being allowed to be up, she had severe renal pain, and had to return to bed.

July 1.—As the attacks continued, I exposed the kidney by an incision through the right linea semilunaris. The kidney seemed healthy and only moderately hypertrophied; no dilatation of the ureter; no stone found on free exploration with a needle; wound healed by primary union. 8th, passed 33 oz.; 10th, 55 oz. Allowed to be up.

For the remainder of July and during August she seemed pretty well.

September 12.—Allowed to go out in the hospital square, but vomited five or six times in the evening, and had suppression for several hours; urine contained much blood, and was passed with much pain and difficulty.

For the rest of the month pain was severe, the urine contained blood, and she grew very weak.

November 14.—Complained of tenderness over cæcum; there was dulness on percussion, and the bowels were constipated. Sp. gr. of urine 1019.

November 18.—No urine passed since the night of the 16th; pain severe; pulse weak and intermittent. Urine to-day contains mucus, epithelial cells, and blood-corpuscles, but no casts. Sp. gr. 1024.

December 13.—No urine for fifty-two hours. Temp. this morning 99.6° , last night 102.6° . Hallucinations yesterday.

December 15.—Urine still in very small quantity and containing blood. Pulse 160. Complains of general abdominal pain.

December 19.—Eight oz. of urine yesterday, containing very little blood. Much abdominal pain; passing urine freely to-day. Sp. gr. 1010, acid; a trace of albumen.

February 6.—Only 2 oz. of urine in twenty-four hours. Sp. gr. 1030; contains much blood.

February 10.—Four oz. of urine. Temp. last night 102.2° , this morning 99.8° .

February 14.—The kidney was explored again to-day; the ureter was opened 2 inches below pelvis, and a long probe passed down it, but there was no obstruction. The substance of the kidney was then incised, so that the pelvis and calices could be explored with the finger, but no stone was found. The opening in the ureter was closed with two fine sutures.

February 16.—Patient much collapsed after the operation, but she has rallied. No urine passed, but some has soaked into the dressings.

She gradually sank and died on the 17th.

Post-mortem Examination.—Thoracic viscera normal. General adhesions, especially in the right iliac fossa. Here also there was much brownish fluid, evidently faecal. Further examination showed that this came from an open and ulcerated vermiform appendix, around which was much inflammatory thickening. It was evident that a collection of

inflammatory exudation had been liberated at the time of the operation through interference with coils of adherent intestine. The right ureter was a little dilated and bound down by fibrous tissue near the cæcum. The right kidney was large and pale, but otherwise healthy. It contained no calculus or gravel. Around the uterus were many old adhesions fixing it to the neighbouring parts. The rest of the viscera were healthy. (I may add that the mischief about the appendix had apparently occurred in the previous November, when symptoms referable to appendicitis had been present.)

These notes show that between the ages of thirteen and twenty-five the patient suffered with pain in the left loin; that when she came under notice in 1886 she had symptoms of stone in the left kidney; that the kidney was found small and movable, and was removed; that it contained three small stones; that within two months she returned with severe pain in the right kidney, hæmaturia, and scanty secretion of urine; that she left relieved by rest, but was readmitted two months later with the same symptoms; that for the next three years she continued to suffer with paroxysmal renal colic so severe that she sometimes fainted, accompanied with hæmaturia, and frequent and painful micturition, and that during these attacks she either passed very little urine, or went for long intervals—from fifteen to fifty hours—without passing any at all; that these periods of pain, hæmaturia, and partial or complete suppression of urine gradually became more frequent, occurring during 1890 at very short intervals; and that when she died in February

1891, after an exploratory operation, nothing was found, post mortem, that seemed to explain her symptoms—the kidney appearing healthy, and there being no stone, nor any evidence that the ureter had ever been materially obstructed.

Other important points were that the kidney occupied its usual position and connections, and that the specific gravity of the urine was generally 1015 to 1025 ; that on one occasion she passed a small stone, and on another two small bits of calculous material from the right kidney, but that after these were passed her symptoms underwent no change, except that they gradually increased so much in severity that on several occasions she was for many hours apparently in almost a dying state.

With these facts before us, how is this case to be interpreted? When the left kidney had been removed and examined, the facts that it had been freely movable, and that it contained some small stones, seemed to offer an adequate explanation of the symptoms which had been observed, and I think the left kidney may be dismissed. But when we turn to the right kidney it appears very desirable to ascertain, if possible, to what cause the symptoms which were connected with it should be ascribed.

I have not found any case in which such symptoms—intense pain, copious intermittent hæmaturia extending over between two and three years, and intermittent suppression of urine, lasting many hours at a time—have been due to a movable kidney. Besides, this kidney was not movable.

Such symptoms might, no doubt, be produced by a calculus. In respect to this the facts are that

the patient on two occasions passed small calculi, but after these occurrences the symptoms still continued, and yet, as the result showed, no stone was then present; nor was there any dilatation of the ureter, as I think there must have been if the outflow of urine had been obstructed by a calculus. In short, the symptoms seem to have evidently not been due to any mechanical cause; they point rather to some profound vaso-motor disturbance.

Attention was prominently drawn to the subject of vaso-motor disturbance in the fingers and toes and other peripheral parts, in 1862, by Raynaud, who, as all remember, described symmetrical gangrene as a neurosis in which the normal excitomotor functions of the spinal cord, by which it presides over the vaso-motor nerves, is exaggerated.

The value, however, of Raynaud's contribution to pathology appears not to be limited to the remarkable cases he described, but to consist in his clear recognition of the fact, that profound disturbances of the vaso-motor system are liable to occur, and to produce grave and notable clinical phenomena; for it seems probable that not only the peripheries, but other districts also of the circulation may be the seat of disturbances similar to those which he recorded, and that his observations may thus have a wider application than he was aware of.

A remarkable fact respecting Raynaud's disease is its frequent association with intermittent hæmaturia or hæmoglobinuria, in which the urine contains the colouring matter of the blood and a brown sediment of disintegrated red corpuscles. In regard to this, Dr. Fagge (vol. ii. p. 590) remarks, "There

can be no doubt that this singular disorder (intermittent hæmatinuria), in its most characteristic idiopathic form, is closely related to the local asphyxia with symmetrical gangrene which was described by Raynaud"; and Dr. now Sir Thomas Barlow (*Clin. Soc. Trans.*, vol. xvi. p. 186) says, "I am not so foolish as to say that Raynaud's disease and intermittent hæmatinuria are the same disease, but only that they are allied diseases." I think, however, that it may be permitted to ask whether intermittent hæmatinuria may not, after all, be merely one of the phenomena of Raynaud's disease, just as symmetrical gangrene is.

In this connection the very important point may be remembered that Dr. Southey has recorded a case in which, instead of hæmatinuria, true hæmaturia (that is, the passage of red blood-cells with the urine) was met with in a case of Raynaud's disease (*Clin. Soc. Trans.*, vol. xvi. p. 173). His words are—"The urine passed early this morning contained blood-cells enough to bestow a distinct blood-colour, but no casts could be discovered." The hæmaturia in Dr. Southey's case was neither so free nor so persistent as it was in the case I have related, but its occurrence shows that hæmaturia may, as a matter of fact, replace hæmatinuria in Raynaud's disease.

The feature of intermittence, or of paroxysmal recurrence, so marked in the present case, is often conspicuous in Raynaud's disease. In a case of Dr. Southey's (*St. Bartholomew's Hospital Reports*, xvi., p. 16) the patient's fingers became the seat of almost unbearable pain, and "went black" for about

an hour on successive days, and then recovered ; while "during her journey to the hospital, having been normal before, the skin of both shins and calves became blue-black, as if it had been badly bruised." And in another the fingers suddenly became painful, and assumed a dark livid colour, which, however, disappeared in an hour or two. In all three of Dr. Barlow's cases the paroxysmal character of the affection was equally well marked ; for example, it is stated that the attacks, in one instance, occurred mostly in the afternoon, and that many passed off in less than an hour, while the longest duration was seven hours. Indeed, Dr. Barlow remarks that the essential clinical note of Raynaud's disease, at all events, primarily, is the paroxysmal character of the circulatory disturbance.

Paroxysmal pain, which was very severe in my case, is often a very marked feature in Raynaud's disease. It is described as a severe aching and burning pain, or a sharp burning pain of extreme intensity, and almost unbearable, while in one case (Southey) it led to convulsions.

Many cases which are now on record concur in showing that Raynaud's disease is neither constantly symmetrical nor confined to distal parts, such as the fingers and toes and the rims of the ears, but that it may affect various districts of the circulation. Thus in a case noticed by Dr. Southey in a child of three, "brown patches resembling bruises came out over her whole body except her head, and she was left with scars upon her shoulders, in the lumbar regions, and upon the dorsal aspect of both her thighs." Of another patient Dr. Southey records that "her nose

bled frequently for over a period of two weeks, then the tips of her fingers and toes were noticed to be red" (*St. Bartholomew's Hospital Reports*, xvi. 23); while in one of Raynaud's cases, quoted by Dr. Barlow (*Trans. Clin. Society*, xiv. 185), after characteristic attacks involving the extremities had occurred during two or three months, the patient began to suffer from ocular disturbances, "vision between the attacks being troubled and confused," and ophthalmoscopic examination showed "considerable narrowing of the arteria centralis retinae and its branches, while partial momentary 'strangulations' could be seen at times."

The duration of Raynaud's disease may be very prolonged. In one of Southey's cases it extended over two, and in another upwards of four years. The kidney affection in my case lasted upwards of four years.

I am not prepared to maintain that the case I have related owned the same pathology as the cases that have been grouped under the head of Raynaud's disease; but certainly a very strong resemblance presents itself between them.

Leaving its pathology, I must allude to the case in its clinical aspect. From this point of view it may serve as a useful warning. The symptoms observed were those which are currently regarded as indicative of calculus producing obstruction. The case, however, belongs to a group in which severe paroxysmal pain and various other symptoms referable to the kidney have been present, but of which hitherto no probable explanation could be given.

ON OBLIQUE FRACTURE OF THE FEMUR IMMEDIATELY ABOVE THE CONDYLES.

A GRAVE injury of which any practitioner of general surgery may at any moment have to take charge, and the treatment of which may prove difficult and embarrassing, is deserving of careful study in order that some conclusions may be formed as to the best method of dealing with it. Especially is the discussion of such a subject advisable when many of the handbooks of the day either do not mention, or make only a passing reference to it. These remarks are illustrated by the following example of one of the varieties of fracture of the lower end of the femur :—Mrs. R., aged fifty-two, staying at the seaside, on leaving a cab on a dark evening, and intending to mount the three or four steps which led to her street door, mistook her wherabouts and fell into the area, a drop of several feet, striking her left knee with great force against a concrete wall. When a surgical examination was made, it was found that she had sustained a fracture of the lower end of the left femur close to the knee-joint. The fracture was oblique, starting in front immediately above the articular surface of the condyles, and running upwards and backwards so as to reach the popliteal surface of the bone three

inches above the joint. The upper fragment, which was somewhat pointed and bevelled at the expense of its posterior surface, had evidently been driven through the quadriceps extensor tendon, and was felt immediately beneath the skin. Considerable swelling of the knee and of the soft parts around the fracture quickly took place, and made it impossible* to ascertain any further details as to the relation of the fragments to each other. There was shortening of about two inches. A careful and prolonged attempt was made, under an anæsthetic, to get the fragments into place. But, in spite of all that could be done, the upper fragment still remained transfixing the tendon and protruding close under the skin, and the shortening could not be corrected. In this dilemma a Liston's long splint was applied, with the hope that, although shortening and some deformity would remain, the fracture might unite. When, however, the limb was examined six weeks later, it was found that no union had occurred. The two fragments moved with complete freedom on each other. When the case was seen in London seven weeks after the original accident, the effusion into the knee-joint had been absorbed, but there was a good deal of brawny swelling around the seat of injury. The line of the fracture was readily made out; the upper fragment was almost through the skin at a point in the middle line, and three-quarters of an inch above the patella. The lower fragment projected somewhat backward, so that it could be felt protruding (though not to any marked degree) into the popliteal space. The limb was two inches short, and the leg,

* The case occurred before the introduction of the Röntgen method.

when unsupported, became a good deal rotated outwards. In consultation it was agreed that, as—owing to the protrusion of the upper fragment through the tendon—there was no hope that union would follow a further period of rest, and as the limb was at present quite useless, the seat of fracture should be examined in order to ascertain whether it was possible to adjust the fragments; but that, if this could not be done, amputation should be performed. The grounds for this conclusion were the following:—The patient, who was fifty-two, was pale and sallow, and the sp. gr. of the urine—there was no albumen—was habitually low (1015 or less); the ends of the fracture had become embedded in cicatricial tissue and were surrounded by large muscles, and the lower fragment was placed so deeply in the popliteal space, and was so completely overlaid by the upper that it could be reached only with considerable difficulty. A prolonged attempt, therefore, to save the limb would, it was felt, seriously endanger the patient's life. At the operation, which was undertaken eight weeks after the occurrence of the accident, a flap of skin and subcutaneous fat was turned back, and the quadriceps tendon exposed. It was now seen that the upper fragment had transfixed the thick part of the tendon just above the patella, and that the lower fragment could be reached, for wiring or screwing, only by removing two inches of the upper fragment, and by a dissection even more formidable than had been anticipated. In a young subject this would have been undertaken, but at this patient's age it was thought to involve too serious a risk. Amputation was therefore performed. The wound was practically healed

in the course of a week. A longitudinal section of the part is shown in Fig. 19. It will be seen that the upper fragment overrides the patella, and that the whole of the tendon for a distance of about an inch lies between



FIG. 19.



FIG. 20.

FIG. 19.—Longitudinal section of an oblique fracture of the lower end of the femur. Immediately above the patella the quadriceps extensor tendon is seen lying between the fragments. FIG. 20.—Fracture of the femur immediately above the condyles, the quadriceps tendon lying between the fragments and preventing union.

the two fragments. In No. 757 in the Museum of St. Bartholomew's Hospital (*see* Fig. 20) an almost precisely similar condition of parts may be observed. The tendon intervening between the two fragments

has prevented union of the fracture, and the upper fragment lies over the front of the patella. In this specimen firm ankylosis of the knee-joint has



FIG. 21.



FIG. 22.

FIG. 21.—Oblique fracture of the lower end of the femur, with wide overlapping of the fragments. The lower end of the upper fragment protrudes by the side of the patella two inches beyond the soft parts; and has undergone necrosis. FIG. 22.—Shows fracture of the lower end of the femur, in which the displacement of the upper fragment, instead of being forwards, is backwards into the popliteal space. Firm union has occurred. There is complete bony ankylosis of the knee-joint. (St. Bartholomew's Hospital Museum, No. 823.)

occurred. In No. 756, in the same museum (Fig. 21), the femur is broken obliquely four inches above the joint, the ends overlap to the extent of upwards of

four inches, and the upper fragment, which lies along the inner side of the patella, projects two inches beyond the soft parts. No bony union has occurred. The knee-joint is firmly ankylosed.

The particular fracture of which Mrs. R.'s case is an example is one which traverses the lower end of the femur in an oblique direction downwards and forwards, and terminates just above the articular surface of the condyles. It may be produced either by a fall upon the feet—Hamilton records a case in which both femora were thus fractured—or, perhaps, more commonly by a fall on the knee. In some instances of fracture just above the condyles the quadriceps is not injured, either because the force applied, though it breaks the bone, is insufficient to drive the fragments through the tendon, or because the fracture is produced by a fall on the foot when the limb is extended. In this position the upper fragment and the quadriceps tendon are parallel with each other. When, however, the fracture is caused by the direct application of force to the condyles, as in a fall on the knee when the limb is flexed, the quadriceps is in a tense condition, and the fragment impinges upon it almost at a right angle. Under these circumstances the tendon can hardly escape perforation. The main features of the fracture are : (1) Transfixion by the upper fragment of some part of the great tendinous and muscular hood formed by the quadriceps where it passes over the lower end of the femur to be inserted mainly into the upper border and sides of the patella. According to the position of the limb at the time, this transfixion will be in the middle line, or on either side—more often on the inner. (2) Transfixion

or laceration of the suprapatellar pouch of the synovial membrane, so that the knee-joint is directly involved. This must have happened in the present instance. It may lead to acute arthritis, and end in ankylosis. (3) The tilting backwards, by the gastrocnemius and other muscles, of the upper end of the lower fragment into the popliteal space. The amount to which this takes place varies in different cases. In some it is slight, while in others it is considerable. In dealing with this displacement when it is marked, Bryant has divided the tendo Achillis so as to relax the gastrocnemius—a proceeding which Morris, of Harvard, quoted by Hamilton, found very serviceable. A study of museum specimens shows, however, that this tilting of the lower fragment is as a rule less than might be expected. The real difficulty depends on the protrusion of the upper fragment through the quadriceps tendon, so that more or less of this structure intervenes between the broken surfaces. To get the end of the bone out of a buttonhole slit in so strong a tendon as that which the quadriceps forms an inch or two above the patella and when the only means of doing so consists of extension, the effect of which must be to tighten the grip of the soft parts on the fragment, seems a nearly hopeless task. This method was tried with care and perseverance in the case of Mrs. R, but it failed, as it has failed in other instances. In these circumstances the fracture, a few days later, was exposed, and the relation of the fragments to each other investigated. It was then ascertained that the over-riding of the ends was so considerable that a prolonged and extensive operation would

be necessary in order to adjust them. As the patient was fifty-two years of age and in very poor health, this proceeding, as stated above, appeared to involve a serious danger to life. The limb was therefore amputated in the lower third of the thigh.

On dissection of the parts concerned, there seemed ground for believing that in any similar case, if the patient were younger, or in sound health, an attempt ought to be made to get the fragments into position, and wire them together, or fix them with screws. And a longitudinal section of the specimen showed that this proceeding would be very materially facilitated by the removal of the end of the upper fragment, for this step would render it much more easy to withdraw the bone from the slit in the tendon, and it would also provide a more ready access to the lower fragment.

A year later a woman, aged sixty-two, was admitted into St. Bartholomew's Hospital with a fracture of an exactly similar kind, which had occurred a month before. No attempt at union had taken place. A few days later the fracture was exposed through an incision in the middle line: the quadriceps tendon, above the point at which the lower end of the upper fragment protruded through it, was freely divided longitudinally, and an inch and a half of the bone removed. It was then ascertained that the lower fragment, including the condyles and some two inches of the back of the shaft of the femur (the fracture being oblique in a direction downwards and forwards), was merely over-lapped by the upper fragment without much backward rotation. Without much difficulty the

fragments were wired together at two points, and the wound was closed. No shock or other drawback followed the operation, primary union of the soft parts and bony union of the fracture followed. The patient seven weeks later could walk firmly on the limb. So far as it goes, this case shows that in this form of fracture operative interference, even in people of middle or advanced life, may be undertaken with a good prospect of success.

BY-WAYS IN THE STUDY OF DISEASES OF THE SPINE.

I DESIRE to go a little out of the beaten track and to allude to some of the more uncommon forms of spinal disease that are met with in the course of clinical work.

Curvatures that are met with in the First Year of Life.—Pott's disease (tuberculosis) of the spine, though it may occur at any age up to seventy, most commonly begins between the ages of three and ten. I have, however, seen several instances in which it commenced in children less than a year old, the earliest being in a child of six months. This infant had distinct angular curvature in the middle of the dorsal region. In cases which occur thus early—rigidity of the spine, pain and other symptoms that are met with in older patients, are no doubt present, but they are apt to be overlooked, and in the cases I have seen they did not attract attention, and the curvature was the first symptom to be noticed. The main fact in the clinical history of caries in young infants is that the disease tends to advance with rapidity and to produce serious curvature so quickly that irreparable deformity may take place in the course of three or four months. The chief point in treatment is to keep the child at rest in the

horizontal position as absolutely as possible, for in very young children the skin is so readily injured, the breathing is so easily interfered with, and the abdomen is subject to such considerable variations in size from hour to hour, that no mechanical appliance can be used with any hope of success. In these early cases prognosis is by no means favourable. In two of the cases I have met with suppuration occurred and the patients died from exhaustion.

The second form of curvature that is met with in the first year of life is due to rickets. Rickets produces in older children three varieties of curvature: general bowing of the whole spine backwards; ordinary lateral curvature;

and lordosis or increase of the lumbar curve forwards (the condition to which mothers make a quaint allusion when they say that the child is "cutting his teeth in his loins"). The first and second of these curvatures

are met with in the first year of life. The first, when it is originally developed, assumes the form shown in Fig. 23. Later, if the child

is very rickety and is nursed much in the sitting position, it soon takes the outline shown in Fig. 24. When this is the case it may very easily be mistaken for true angular curvature depending on caries; and this mistake is the more likely to be made because rickety children are often tender, so that they cry



FIG. 23.

FIG. 24.

FIG. 23.—General bowing backwards of the spine in rickets.

FIG. 24.—More acute curvature seen at a later stage.

when they are lifted; whilst in those infants who are suffering from scurvy rickets and in whom every movement produces pain, the pain, together with the curvature of the spine, will, unless you are very careful, inevitably lead you to a wrong conclusion. The diagnosis depends upon the following three points: (1) that rickety curvature is very much more common than angular curvature in young infants; (2) that the child is, as disclosed by other evidence, acutely rickety, or is also the subject of scurvy; and (3)—the crucial test—that when the child is placed in the prone position the spine can—without the use of the slightest force, but merely by placing one hand on the loins and with the other hand, in the gentlest manner, raising the extended lower limbs and the pelvis in the air—be not only straightened, but be carried to the point of becoming concave—a change of outline that would be impossible were true angular curvature present.

Lateral Curvature, when it occurs in the first year of life, is exactly similar in form to that which is met with in later periods. In the few instances in which I have seen it at this age the patients were very rickety. Diagnosis, therefore, presents no difficulty. Unfortunately as much cannot be said as to treatment. The weakly muscles to a great extent abandon their function of supporting the column, and deformity, reaching an extreme degree and depending on a formidable change in the shape and the relations of the vertebræ to each other, is quickly developed. Probably the worst cases of scoliosis that are met with in young adults are those which have commenced in early life in rickety children.

Mechanical appliances in these cases are, as in those of caries in early infancy, very unsatisfactory, and obviously the exercises which are so valuable in older children cannot be used. The best course is to treat the rickety state by prescribing a full diet of fresh milk, diluted as far as is necessary, the juice of raw meat, beef-tea or pounded raw meat, plenty of fresh air, and small doses of cod-liver oil; and the child should be kept as absolutely as possible in the horizontal position. This position will prevent the further increase of deformity; but it will be accessory to much more. The future progress of the case will illustrate one of the most important and striking facts in the surgery of childhood—the fact, namely, that growth, when favourable conditions are secured, is a very powerful agent in the removal of deformity. Distorted parts, in fact, “grow straight.” About six years ago an infant fourteen months old came under my notice who was very rickety, and had severely marked lateral curvature with rotation. The deformity had been in progress, as far as was known, for about four months, and was still increasing. The child was kept for the next nine months constantly in the horizontal position in a tray fitted with a mattress, in which it could be carried about. The curvature diminished steadily with the child's growth, which was rapid, and at length it almost entirely disappeared. It must be allowed that this treatment is very tedious; but, as far as I know, in no other way can extreme deformity be averted and a satisfactory result obtained. During this treatment gentle massage should be employed to maintain the nutrition of the spinal muscles.

2. *Quiet Spinal Caries*.—The symptoms of spinal caries in different individuals are subject to considerable variety. In some instances pain, stiffness and impaired function are present in a marked degree, and in others all active symptoms, except stiffness, are so nearly absent that the main evidence of advancing disease is a slowly increasing angular deformity. But cases are occasionally seen in which the usual symptoms entirely fail to attract attention. Some years ago I met with a patient, aged nineteen, who had a perfectly distinct angular curvature of the lower dorsal spine, of which he could give no account. His back was perfectly strong, and he was leading an active life; and he could not remember any period at which his spine had given him any inconvenience. Such a case may appear very remarkable—even perhaps inconceivable; but I may confirm my own observation by mentioning that both Sir James Paget and Sir T. Smith have met with exactly similar cases. I think I can throw some light upon the subject by referring to what is not rarely seen in cases of tuberculous disease of the joints—namely, that the inflammation which the tuberculous disease provokes is sometimes plastic in its character, and may end, apparently in a few months, in firm fibrous, or even, though perhaps more rarely, in complete bony ankylosis. In these cases—and I have seen enough of them to be quite sure of their occurrence—a joint (it has been most commonly either the elbow or the shoulder) is found to be firmly ankylosed, but how or when the ankylosis occurred the child's parents have been quite unable to explain (*see* p. 79). It would seem as if the tissues

although unable to prevent the establishment of the tuberculous process, yet maintain a vigorous struggle against its further advance, and, winning the day, speedily undergo sound repair. In this way, perhaps, a case which occurred a few years ago may be explained. A boy, aged nine, had a perfectly obvious and advancing angular curvature of the dorsal spine, for which complete rest and a plaster-of-Paris jacket were employed. When this treatment had been followed for six months the patient was taken to a bone-setter, who said that one of the buttons of the back was out. This he proceeded to put in by manipulation—although, as may be supposed, without producing any change in the curvature—and he then ordered the boy to go about as usual. He forthwith did so, and no further development of spinal symptoms has since occurred. Now, the fact is familiar to all that when angular curvature has once become marked sound repair does not generally take place in so short a time as six months; but the form of plastic inflammation leading to rapid ankylosis which I am alluding to may run its course, I am sure, well within this period.

3. *Malignant Disease*.—Primary sarcoma of the spine is very rare; but two examples of it may be briefly related. They are instructive, for in both an erroneous diagnosis was made and acted upon. They were, in fact, both mistaken for tuberculous caries attended with the formation of angular curvature and abscess, and in both the resulting swelling was cut into in the belief that a collection of matter was to be evacuated. The first case occurred some years ago at the Hospital for Sick

Children, Great Ormond Street, when I was Surgeon there.

CASE I.—A girl, six years of age, had, as it appeared, clear symptoms of tuberculous caries of the cervical spine. The head and cervical spine were kept in a fixed position; movement caused pain. The child supported her head with her hand as children do when they have spinal caries, and the spine had yielded so that the patient had wry-neck. Soon a deep-seated and elastic swelling appeared in the right sub-occipital region which was regarded as an abscess. This gradually enlarged and approached the surface, and, when superficial enough for fuller examination, seemed to fluctuate distinctly. When an incision, however, was made, nothing but blood escaped. Subsequently what was obviously a sarcoma rapidly attained a large size, and the child died about two months later. At the *post-mortem* examination the left halves of the three upper cervical vertebræ were found to be almost entirely destroyed and replaced by new growth.

CASE II.—A young woman, aged twenty-four, was said to have originally complained of pain in her left side when she was sixteen years of age, and to have had curvature of the spine at eighteen. She had always been delicate, but had been able to walk until she was twenty-two. She then moved with difficulty, and complained of pain in her back and sides. Four months before I saw her she became unable to walk. When I saw her she had very marked deformity of the lower part of the lumbar spine, exactly similar to that which results from caries and excavation of two or three vertebræ. In the left iliac fossa there was a

large, highly-elastic, tense swelling, which occupied the position of, and presented a perfect resemblance to, an iliac abscess depending on Pott's disease. When the swelling was incised, however, it proved to consist of a large sarcomatous growth. The great rarity of such a case as this, and the exact manner in which it assumed the features of a very common disease involving the same parts, made it, like the one first related, extremely deceptive.

The Museum of St. Bartholomew's Hospital contains several specimens of sarcoma of the vertebral column. No. 438A shows a sarcoma in a boy aged eighteen, springing from the laminae of the sixth, seventh, and eighth dorsal vertebræ, which, as it grew, destroyed the cord. The patient lived only six months. In No. 517A the bodies of five vertebræ are extensively destroyed. No. 1130 shows sarcoma of the sixth cervical vertebra on the right side, compressing the cord, from a woman who had primary sarcoma of the uterus, with secondary deposits in the spine, lungs, and pericardium. In No. 1132A sarcoma involved the last cervical and four upper dorsal vertebræ in a man aged forty-six.

4. *Carcinoma of the Spine*.—This may be one of the secondary developments of carcinoma of the breast and of other parts also. I recently saw a patient who, having found a tumour of the breast which she was afraid might be cancer, had kept the matter to herself for nine months. During this time the growth steadily increased, and in the last two months she had suffered from very severe pains in her spine at the level of about the fourth dorsal vertebra and also round the sides of her chest.

She had also found great difficulty in walking. When the spine was examined a well-marked angular curvature was found. This case illustrates an important group. If serious mistakes and oversights in practice are to be avoided, it is necessary to study not only diseases but the subjects in whom they occur. Amongst other things it must be remembered that patients, either through fear or for some other motive, will sometimes, with remarkable skill and by recourse to many devices, keep their secret about some disease from which they are suffering, so that their most confidential friends are entirely ignorant of their condition. To mention another case. A woman, aged forty-three, had severe girdle pains round the lower ribs and pain in the spine, with weakness of the legs. The pain was sometimes intense, and she moved with difficulty. Evidently serious mischief was in progress. At first sight the case might have been regarded as one of acute spinal caries, but the severity of the symptoms was out of all proportion to the local evidence, for all that could, at this period, be made out was that the spine was stiff. There was no angular deformity. As it was thought that possibly a new growth was in progress, the patient was asked about any swelling elsewhere, particularly in either breast, but she said that nothing of the kind was present. When further pressed, however, she allowed that she had known of a swelling in the left breast for eleven months. On examination, a far-advanced scirrhus was found, together with extensive enlargement of the axillary glands. A few weeks later angular yielding of the

spine became apparent, and pain was very severe; the right lower limb and, three weeks later, the left became paralysed, and the patient lost control of urine and fæces, had large bedsores, and died from exhaustion eight months after the first symptoms were noted.

In the Museum of St. Bartholomew's Hospital No. 1229 consists of the upper cervical vertebræ of a man aged thirty-five, who had suffered for eight or nine months from pain in the neck and shoulders, which was attributed to rheumatism. For the previous four or five months an alteration of his gait had been observed: the shoulders were elevated and the neck was shortened. For two months he had been unable to wear a collar. One month before death the limbs and intercostal muscles became paralysed. Power in the left arm and leg first failed, and in the course of a few days the paralysis was complete. The urine and fæces were passed involuntarily. The immediate cause of death was paralysis of the respiratory muscles. On examination the second and third cervical vertebræ were found to be almost entirely destroyed by carcinomatous growth. The seat of primary disease is not mentioned in the Museum Catalogue. No. 1131 consists of seven cervical vertebræ from a man who died of scirrhus cancer of the breast, and secondary deposits in other organs. Five vertebræ are affected with scirrhus cancer. In the first and last two the cancellous tissue is loaded with the growth, whilst the two intervening vertebræ are almost entirely destroyed. The chief indications of the disease consisted of severe pains like those of rheumatism in the loins and lower limbs. It is not

stated whether any paralysis occurred. No. 2540 shows a soft, brain-like carcinoma, projecting from the left side of the cervical spine from the fourth vertebra to the sixth vertebra. The growth is attached to the posterior surface of the dura mater. A portion of the fourth vertebra is infiltrated and softened. The disease was secondary to carcinoma of the pancreas. The patient was a man aged forty-six, who came under the care of Dr. Ormerod in July 1879, complaining of constipation and abdominal pain. He had already had pains in the left shoulder, and in the previous week had lost power in his left arm. This pain and loss of power in the arm increased, and the muscles became atrophied. He had numbness in the fingers and he quickly lost flesh. Two months later he began to lose the use of his right hand, and complained of pain in the right biceps. In a few days both his legs became paralysed, and the paralysis extended and became complete in all parts except the right arm. The respiration became embarrassed, and he died in about four months after his symptoms were first observed. The tumour remained deeply seated, and was not noticed till a *post-mortem* examination was made.

The symptoms of malignant disease of the spine bear, it will be noticed, at first sight a very close resemblance to those of acute Pott's disease. The deformity which occurs is the same, and pain in the column and in the course of the intercostal nerves is also similar in the two affections; yet a closer study will usually disclose certain differences which are sufficient for a correct differential diagnosis. In the first place, pain is generally much more severe

from the outset—altogether a much more prominent symptom—in malignant disease than it is even in the most acute cases of Pott's disease. In some cases it amounts to agony. And it is persistent and is not removed, or even materially relieved, as the pain attending Pott's disease usually is, by complete rest. Secondly, the disease advances much more rapidly than caries does, so that deformity makes its appearance very early—in the course of a few weeks—and then rapidly increases. Thirdly, paralysis, at first of a single limb, or even of a single group of muscles, but soon becoming extensive, is commonly present within the first few weeks, and instead of tending to pass off—as is the case with paralysis due to Pott's disease when the spine is placed at rest—in malignant disease it tends steadily, and often rapidly, to become worse and worse. Fourthly, incontinence of urine and fæces is soon developed, and bedsores quickly form. Fifthly, the patient, instead of improving and gaining flesh, as is the case when he is placed at rest for Pott's disease, rapidly loses flesh and becomes feeble and cachectic. Sixthly, the course of the case is a steady and usually a rapid progress from bad to worse, so that, speaking generally, the patient does not survive for more than six or eight months. Lastly, there is in many cases evidence of primary carcinoma in the breast or elsewhere, a circumstance which in any doubtful case he who would avoid mistakes must obviously be determined not to overlook.

5. *Syphilitic Disease of the Spine*.—This, I believe, is a rare condition. But very scanty allusion to

it is found in the handbooks at present in use, and I have met with it, as far as I know, in only two or three instances. These have been in the tertiary stage of syphilis, and in the form, judging from the symptoms, of chronic osteitis and periostitis, similar to that which may attack any of the long bones. I will briefly relate the case which seemed to be the most clear illustration of the condition that I have seen. A man, forty-five years of age, came to the Hospital with tertiary syphilis, from which he had suffered severely at intervals for upwards of fifteen years. He now had several broken-down gummata on the skull with severe hemicrania and numerous syphilitic scars about his face, trunk, and limbs. He complained of severe nocturnal pains in his back, and said that his spine was becoming bent, and so stiff that he could not stand upright. On examination, the dorsal curve of the spine was found to be considerably increased, so that the shoulders were very round and the head was bent forwards, and the column was stiff, so that the patient could not stand upright. Attempts at movement were unattended with any increase of pain, and so was exercise, except that it produced the aching of muscular fatigue. The patient was ordered five grains of iodide of potassium, increased in the course of a few days to twenty grains three times a day. He rapidly improved in general condition, the gummata were absorbed and his ulcers healed. His hemicrania and also his spinal pain were quickly relieved, and the stiffness of the column was much diminished. Six years have since elapsed, and he has been seen from time to time. After a course of

iodide of potassium he remains for a time fairly well. Then new gummata or cutaneous ulcers make their appearance, and pain returns in his head, or, with the same feature of severe nocturnal exacerbations, in his spine. This always yields, as do the other lesions, to a fresh course of the iodide of potatsium. Each attack, however, has left the spine more bent and more stiff, and when I last saw him he was unable to raise his head above the level of his lower dorsal vertebræ. The direct proof that the spinal affection is syphilitic is wanting, as the patient is still living, but that it is syphilitic can, I think, hardly be reasonably doubted, when it is remembered that the patient is subject to inveterate tertiary syphilis, that the affection is always combined with other syphilitic lesions, that it is attended with nocturnal pains closely resembling those which affect the cranium, and that its active symptoms have always readily yielded to a course of iodide of potassium.

DIFFERENTIAL DIAGNOSIS OF NEW GROWTHS AND INFLAMMATORY ENLARGEMENTS OF THE BONES.

THOSE who have most often made the attempt will be the first to own how difficult it sometimes is to say whether an enlargement of a bone is inflammatory or due to a new growth. Yet the question is one of great importance, for it generally presents itself in reference to such large bones as the femur, tibia, or humerus, and involves the consideration whether either amputation through the bone higher up or disarticulation at the joint above should be performed.

There have lately been some cases under observation which will illustrate this subject, and other examples are found in the Museum of the Hospital.

CASE I.—A man, age twenty-eight, had a swelling of the size of a hen's egg situated at the posterior border of the tibia, at the junction of its uppermost with the middle third. It was prominent, clearly circumscribed, irregular, and indistinctly lobed, firm, and quite inelastic. It had been slowly increasing in size for nine weeks, and was neither painful nor tender on pressure. The tumour was just such a swelling as might be due to a circumscribed periostitis, either syphilitic or tuberculous, with heaping up of inflam-

matory products not yet softened ; but it also bore a very close resemblance to a periosteal sarcoma. My first view, though held with considerable doubt, was that the disease would prove to be tuberculous ; but as it was possibly syphilitic, I prescribed five grains of potassium iodide three times a day, and a few days later increased the dose to ten grains. This medicine produced no effect, and I then, reverting to the probability of tubercle, gave the patient quinine and cod-liver oil, and advised horizontal rest for the limb. As the swelling, however, still increased (chiefly at the back rather than at the inner border of the bone, so that it became less easy to examine it), and as there was now some œdema of the leg below, as if there was pressure on the deep veins, but no redness of the skin or other evidence of inflammation, I grew more suspicious that the case was one of sarcoma, and took the patient in the theatre for consultation. Several members of the staff saw the swelling, and, though all advised exploratory incision as a matter of precaution, the great majority looked upon it as in all probability a sarcomatous growth. A few days later, therefore, having applied an Esmarch's bandage, I exposed the tumour. The periosteum and the structures over it were condensed and matted together, and on cutting into the swelling I found that it was a thick-walled abscess containing two or three drachms of caseous pus. The deceptive character of this swelling up to the moment it was cut into was complete.

CASE II.—Some years ago a boy, aged nine, was in the Hospital for Sick Children, with enlargement of the right superior maxilla. The swelling had gradually

formed in the course of the previous four months ; it projected forwards, and also downwards, so as to cause bulging of the hard palate ; it was as firm and hard as bone ; the skin over it was normal. There had been little or no pain, and there was no tenderness on firm pressure. Those who saw the patient agreed that the swelling was solid, and either osteoma or osteosarcoma ; and the case seemed exactly similar to one in which I had removed the superior maxilla in a boy, aged eight, for osteoma, at St. Bartholomew's Hospital a few months before. Two days later I proceeded to remove the bone. Having divided the upper lip, and carried the incision up along the side of the nose so as to expose the tumour, I was prompted, by a fortunate inspiration, to do what should certainly have been the first step in the proceeding, and I perforated the swelling. I then found that it was a collection of pus in an enlarged but still thick-walled antrum.

CASE III.—A boy, aged eleven, was recently admitted into St. Bartholomew's Hospital, who seven weeks before had fallen upon his right knee. The injury seemed slight, and the boy complained of no pain until the next day ; then some liniment which was applied at once relieved him. From the time of the accident the lower third of the femur slowly enlarged. On the boy's admission the femur just above the condyles measured in circumference two and a quarter inches more than the right. The swelling involved the shaft on all sides, so that the whole bone was enlarged. The enlargement, however, was especially marked on the posterior aspect, and the popliteal space was to a great extent filled up, while on the inner side of the space a large nodular mass could be

felt projecting beyond the surrounding level. In an upward direction the enlargement terminated somewhat abruptly, leaving the shaft immediately above of its normal size. The swelling was everywhere of bony hardness, the skin over it was normal, except that some of the cutaneous veins were distended. There was slight effusion into the knee-joint. The temperature in the axilla was 99° in the morning and 100° in the evening.

In this instance I formed the opinion that the swelling was a periosteal sarcoma, mainly on the ground that the enlargement, everywhere hard and solid, almost filled up the popliteal space, and in one part formed a prominent lobe or boss, as if the disease was developing with special activity at this spot. The size which the enlargement had attained in the course of seven weeks, the fact that there had been very little pain, that no suppuration had occurred, and that the skin and soft parts were natural, were points which all seemed to indicate a new growth. Other features of the case will be discussed in the remarks that follow. A few days later an Esmarch's bandage was applied, and the swelling was exposed by a free incision, and carefully examined. The superjacent tissues seemed in a natural condition, and no evidences of inflammation were met with. The bone where it was exposed in the lower part of the incision was found to present a very irregular and uneven appearance, due to numerous small, low-crowned, tuberos masses projecting from its surface, while just above it was smooth and almost normal, and the unaltered periosteum was readily stripped off it in a uniform layer. As these features seemed to

confirm the diagnosis of sarcoma, amputation was performed. On examination afterwards, a longitudinal section of the bone having been made, it was found that the disease was after all only inflammatory.

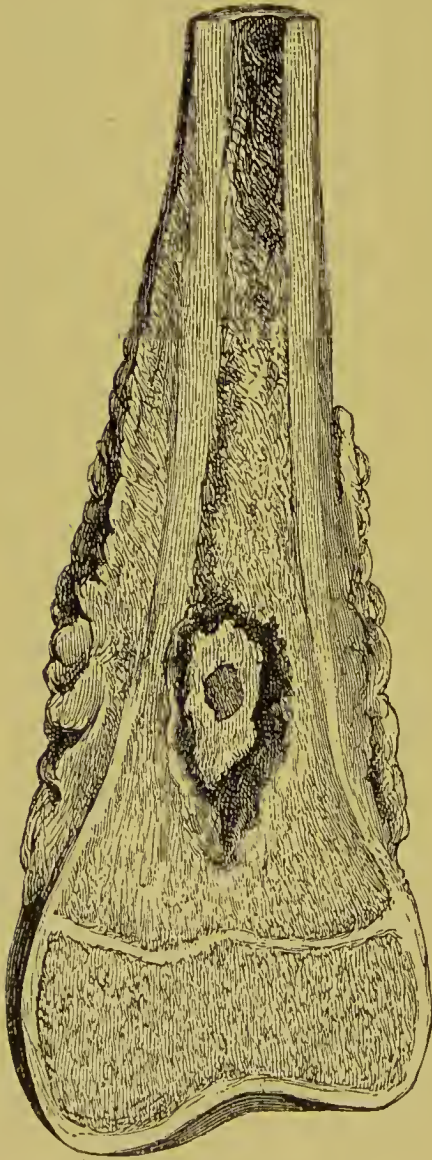


FIG. 25.—Central necrosis of the femur.

In the centre of the swelling (Fig. 25) was a sequestrum derived from the compact substance of the original shaft, and the enlargement was due to the profusion with which new bone had been deposited in an irregular manner by the periosteum. The cavity which contained the sequestrum was on all sides deeply walled in by firm bone, except that there was a very narrow passage, only large enough to admit a probe, which led from it through the encasement of new bone into the popliteal space. At the external orifice of this passage a bead of pus, the size of a pin's head,

was seen, indicating that suppuration (the evidences of which would soon have declared themselves externally) had just commenced.

CASE IV.—In the Museum is a specimen (258A) of necrosis of the femur from a case with the following history. A man, aged twenty-nine, was admitted with a fusiform enlargement of the middle third of the shaft of the femur. Many of the staff saw the case, and differences of opinion were expressed as to the nature of the disease, some thinking it was a new growth, others that it was inflammatory. To determine this question the surface of the femur was exposed by a free incision, and a careful examination was made, with the result that all who were present came to the conclusion that the disease was sarcoma. Amputation was then performed. When the specimen was dissected, it was found that the case was one of necrosis. Imbedded in a large mass of new bone was a loose sequestrum, derived from the compact tissue of the original shaft. The new bone was deposited so as to constitute a somewhat irregular swelling.

CASE V.—Mr. Morrant Baker recorded in the *Medico-Chir. Trans.*, vol. lx., a case which forms a very valuable contribution to the group under discussion. A man, aged twenty, had been quite well till about ten weeks before his admission into the Hospital. He then had deep-seated pains in the left thigh, soon followed by slight swelling. Both the swelling and pain gradually increased, and pain at night became severe. Six weeks later, as the patient was walking across his room the femur broke opposite the middle of the swelling. On admission into the Hospital he was found to have a large swelling of the thigh extending from the trochanters to the condyles. The integuments were natural, and so, apparently, were the soft parts down to the enlargement; there was neither red-

ness of the skin nor œdema of the surface, nor any deep-seated elasticity. The temperature was below 100° . No glands were enlarged. Many of the staff saw the case, and all regarded the disease as malignant. Mr. Baker, therefore, performed amputation at the hip-joint. The patient made a good recovery. On dissecting the limb, there was no inflammatory condition evident, no abscess or sinus, and no pus; but a longitudinal section through the swelling showed that there was necrosis of nearly the whole shaft of the femur. The enlargement was due to the deposit of somewhat bulky callus. The periosteal sheath of new bone extended from the lesser trochanter to the condyles.

It will be seen that here are five cases, all of which were carefully examined and fully considered, and yet in all of which the affection present was believed to be malignant, when, as a matter of fact, it was inflammatory. In two, the mistake was made even after the bone had been exposed by an exploratory incision, while in two others a similar mistake was avoided only by direct exploration. With these cases before us as a reminder of the difficulties that are often met with, it may be useful to examine the evidence which must be depended upon in making a diagnosis between new growths and inflammatory enlargements of the bones, and to see how far each of the points that may be present is, on the one hand reliable, or on the other deceptive, or, at the best inconclusive.

(1) An important first step on entering upon the investigation is to recollect that inflammatory enlargement of any of the long bones is, at all events in subjects under twenty, much more common than

a new growth. I should be inclined to say in the proportion of at the least three to one. When I was surgeon to the Hospital for Sick Children, I remember several cases which were sent with, as it was said, malignant disease of the femur, but of which the large majority proved to be merely inflammatory (tuberculous osteitis): and in his work on the Surgery of Childhood Mr. Holmes remarks that he has known at least three cases in which amputation at the hip-joint was contemplated for an affection of the femur which turned out afterwards to be inflammatory. This element of what may be termed numerical probability is one of the main principles of a sound diagnosis. The larger his experience, the more unwilling does the judicious surgeon become to regard a case as something rare, instead of something that is comparatively common, unless he is driven by clear evidence to that conclusion. It is often safer to trust to a strong general probability than to appearances which, so far as they go, point to some comparatively rare disease. It is obvious that this method might easily be pushed too far. Yet to remember that the chances are, say, three to one against a particular view, will often act as a useful check, and avert the mistake of attaching undue weight to symptoms or appearances which, when they are critically estimated, are seen to be of little substantial significance, or which will equally well fit in with some alternative conclusion.

In the present case, the fact that numerical probability inclines strongly to inflammatory enlargement as against new growth must be kept well in view.

(2) At first sight a *distinct history of injury* would seem to indicate that an increasing enlargement of a bone was probably inflammatory. This inference would often, but by no means always, be correct, for many remarkable cases have been recorded in which a new growth has appeared with startling rapidity in a part after injury. Sir James Paget* has related an instance in which a malignant tumour around and within the fibula attained a large size (and was removed by amputation) within eight weeks after a strain, or perhaps fracture of the bone. I have myself seen a case in which a man of thirty-four sustained fracture of the lower third of his humerus—together with other injuries—as the result of a railway accident. The fracture did not unite and seven weeks later was found to be the site of a rapidly increasing swelling. Three weeks later this was explored and found to be a round-celled sarcoma. Amputation, therefore, was performed.

(3) *The shape or conformation of the swelling* is often no guide. The swelling which is symmetrical, so that it involves the bone equally on all sides, shading off gradually into the shaft above and below, and presenting no lobes or low-crowned bosses, is more likely to be inflammatory than a new growth; but, on the other hand, a new growth, instead of being, as is usually the case, lobed, nodular, or irregular, and involving the bone only on one aspect, and leaving other parts free, may be symmetrical, fusiform, and smooth; while an inflammatory enlargement may involve the bone chiefly in one direction, and may, as in Case III., present

* "Surgical Pathology," 3rd. ed. 1870, p. 685.

irregular tuberos projections strongly resembling the jutting lobes of a new growth.

(4) *The Consistence of the Swelling*.—Inflammatory enlargements are often in this respect precisely like osteo-sarcomata—firm and inelastic, dense like bone, and with no softness or sense of yielding anywhere. They are, in fact, formed of material which in physical characters very closely resembles callus; while, conversely, a rapidly-growing sarcoma may be so elastic that it feels like a soft inflammatory swelling. I lately met with a case in which a new growth involving the condyles of the femur very closely imitated pulpy tubercular thickening of the synovial membrane of the knee; and the resemblance was increased by the presence of some fluid in the joint, due no doubt to impeded venous circulation. A man, aged twenty-seven, had, as it was believed, a large abscess in the lower third of the thigh as the result of periostitis of the femur. The swelling was so elastic that no doubt was entertained that it contained fluid, and the skin over it was over-warm, dusky, and thin. On his admission to the Hospital, however, a suspicion arose as to the nature of the case. The man looked ill, and was wasted and feeble, and on examination the inner side of the femur could be felt irregularly enlarged. The affection proved, on exploration, to be a periosteal sarcoma, into whose soft, almost brain-like substance, considerable hæmorrhage had taken place. But, in spite of these resemblances and the chances of error which they involve, a very careful study of the consistence of the swelling is of great importance, and will sometimes give the only clue to a correct diagnosis. The

whole superficies of the swelling must be minutely searched for any circumscribed or isolated yielding, or any soft or tender spot, for usually, except in its most chronic examples, tuberculous osteitis sooner or later suppurates, and matter escapes through a small hole in the new bone, and gives rise to a "soft spot" or a "tender spot" (*vide* pp. 99 and 100). In Case III. suppuration had just commenced, and a bead of pus had reached the surface of the bone. In two or three days it would have given rise to the "soft spot" by which its presence would have been clearly indicated.

(5) *Rate of Growth*.—This throws no light on the question of diagnosis. In both osteo-sarcoma and osteitis the rate of increase of the swelling varies widely in different cases. In both alike it may be either slow or rapid. Thus, in Case III., enlargement due to osteitis and the deposit of new bone had become very marked within seven weeks, and in Mr. Baker's case a large tumour, due entirely to the formation of new bone, had been developed by an osteitis which had been in progress only six weeks. On the other hand, new growths have, in some instances, supervened so quickly after injury as to attain a large size within a few weeks. In short, rapidity of enlargement is a phenomenon often observed in both osteitis and malignant disease. As little can be inferred if the increase of swelling is slow, for in osteitis and osteo-sarcoma alike, especially if the latter is central, three or four months or more may elapse before enlargement becomes considerable. If, however, careful observation shows that the enlargement is not increasing, and, *a fortiori*,

that it is diminishing (independently of any mere decrease in the amount of accidental swelling of the soft parts due to position, and now removed because the position of the limb is changed), this circumstance would, of course, be suggestive of osteitis rather than of new growth.

(6) *Condition of the Skin and deeper soft Parts over the Swelling.*—This affords no indication that can be trusted. The skin may be turgid and dusky, and the subcutaneous veins distended and tortuous over an inflammatory enlargement, just as is often the case when the disease is malignant; while in both Case III. and Mr. Baker's, although the disease was inflammatory, the surrounding soft parts seemed healthy, and were neither swollen nor brawny or indurated, or otherwise changed. Even when an exploratory incision was made down to the bone in Case III., there was no evidence in the soft parts of any inflammatory change. In many instances of new growths also the superficial soft parts have their circulation uninterfered with, and remain in a perfectly normal condition.

(7) *Pain.*—In some instances pain is so constant and severe, and so distinctly exacerbated at night, that it is strongly suggestive of osteitis; but generally it is a symptom to which little weight can be attached, for in some cases of osteitis it is insignificant in its amount, or even entirely absent, while in some cases of new growth it is severe. All that can be safely held, I think, is that pain is more distinctly a symptom of osteitis than of a new growth in bone.

(8) *Tenderness on pressure*, if it is distinct, is a symptom which is rarely present in a new growth.

It must be regarded as strong evidence of inflammation as against sarcoma.

(9) At first sight it might be thought that *the body-temperature* would form an efficient guide in the diagnosis between malignant disease and osteitis, except when the latter is chronic. But this is not the case. In the first place, the temperature may remain normal although the disease is inflammatory, and is producing swelling at a rate which, if taken alone, would be strongly suggestive of malignant disease. While, on the other hand, a considerable elevation of temperature may be present in cases of malignant disease.

On p. 246 I have mentioned two cases of periosteal sarcoma in which the temperature rose in one to 102° and in the other to 103° ; and an instance in which, in sarcoma of the kidney of a child, the temperature was as high as 102° . The rise in such cases is probably the result of tension produced by the rapid growth of the tumour.

Thus far it is clear that, when every available feature of the case has been carefully weighed, the question whether the disease is inflammatory or malignant may still remain a doubtful one. Different reservations which have to be made so whittle down what at first seems good evidence, that no trustworthy conclusion (in many instances) is reached. The appeal must therefore be to a direct inspection of the swelling when it has been well exposed by a sufficiently free incision. This is a step which—however clear it may appear that the disease is malignant—ought not be neglected. In Mr. Baker's case no one who saw the swelling expressed any doubt

that it was of a malignant nature ; yet it was inflammatory. In two other cases in which the view that the disease was malignant had been endorsed by general consent, the fact that it was inflammatory was ascertained only when an incision had been made. The difficulty of diagnosis is but the parallel to that which often presents itself in the case of swellings of the breast, testis, and other soft parts, where a neglect of an exploration has sometimes led to the removal of organs which, had greater caution been used, might have been preserved.*

But it must always be remembered that even when an incision has been made and the surface of the tumour critically examined, an error may still be committed. In Case IV. such an examination was made, and though the disease was inflammatory, there was nothing to indicate that it was so : no pus or recent lymph, and no inflammatory induration, cicatricial thickening or matting of the tissues together, and in Mr. Baker's case dissection of the limb after removal showed that all the soft parts down to the bone were perfectly healthy, for the disease was central—that is, it was entirely covered in and masked by new bone. The complete manner

* The difficulty of deciding whether a swelling is inflammatory or malignant was well illustrated many years ago in the following case. I was asked to see a little boy of 5, with an enlarged testis. I expressed the view that it was malignant, but was then told that, an hour before, Mr. Curling had pronounced it tuberculous. Wishing for a consultation, I went with the parents to Mr. Curling's house. I then found that after the patient left him he had written a letter, which he now handed to the child's father, and in which he said that, on thinking the case over, he had come to the conclusion that the disease must be malignant. We then examined the case together, and he still believed that his second opinion was the correct one. Yet the event showed that the disease was after all tuberculous.

in which the evidences of inflammation may be obscured is well shown in Fig. 25.

But the difficulty of diagnosis may take another form. When the bone is exposed by a free incision, its surface may present obvious changes; but these may be so deceptive that, though they are the result of osteitis, they may be mistaken for the indications of a new growth. This mistake was made in Case III.

After an Esmarch's bandage had been applied, and a free incision made and the parts well retracted, what we saw misled both myself and one of my colleagues, than whom no one is more competent to pronounce an opinion on any point of surgical pathology or morbid anatomy.

There remain three further points of evidence that must be taken into account if the case still remains open to doubt. Instead of being content with merely exposing the surface of the swelling, it may be advisable to cut deeply into its substance with a narrow-bladed chisel, and remove a substantial wedge-shaped block, say an inch long, a quarter broad, and three-quarters of an inch deep. If the case is inflammatory, the block will present the structure of cancellous bone—that is, it will be more or less porous or trabeculated, not dense and amorphous, like a section of chalk; nor will it present anything of a fibrous texture, like a firm sarcoma, or any appearance of an admixture of cartilage.

A microscopic examination may be made. But such an examination, if it is undertaken, so to say, roughly and at the moment, may be quite untrustworthy.

Indeed, in Case IV. a portion of the swelling when put under the microscope was erroneously thought to have the structure of a new growth. To be conclusive, the examination must be made by preparing a section and staining it in the usual manner. This will take from one to three days, but that is a matter of no importance if, as should of course always be the case, the wound is strictly guarded against infection.

In the next place, the swelling may be carefully watched and measured at short intervals, to see whether it is still growing, or is, on the other hand, stationary, or even decreasing. The fact that a swelling is still increasing is obviously no evidence that it is a new growth; but should it be clear that it is diminishing, this fact may be allowed considerable weight as evidence that the disease is inflammatory; for while, in the case of a new growth, adventitious swelling, due to position and other accessory causes, is, as a general rule, but slight, in inflammation it is considerable, and will therefore subside to a marked extent when the limb is kept in a favourable position and at complete rest.

In these remarks I have endeavoured to review the various data which may be appealed to, and to show that one and all of them may, unless the greatest caution is used, be deceptive. I am afraid I may seem to have proved that a correct diagnosis is sometimes impossible. I have no wish to take up such a position; but my object has been to show that it is only by the exercise of great care and circumspection that mistakes can be avoided.

NEW GROWTHS IMITATING TUBERCULOUS DISEASE OF THE JOINTS AND SPINE.

CASES not seldom present themselves in which what has every appearance, *even on close examination*,* of being tuberculous disease of a joint, proves to be sarcoma of the end of one of the bones, or, though with great rarity, of the synovial membrane itself. Such examples deserve careful study; for some of them probably, and others almost certainly, will lead to grave error of diagnosis. The true nature of the disease will escape detection, and amputation, the only treatment that can be of any real service, will be withheld till it has become almost or quite useless. The following cases have come under observation in the last few years;

1.—*Periosteal Sarcoma of the Lower End of the Femur, simulating Tuberculous Synovitis of the Knee.*

CASE I.—A lady, aged twenty-three, found that

* I use italics, because I wish not only to endorse the common observation that malignant growths and tuberculous swellings sometimes resemble each other, but to go further and dwell upon the fact that instances are not rare in which a correct diagnosis can be arrived at only after repeated examination and the most critical consideration of every symptom both in itself and in its relation to all the other features of the case.

her right knee was painful and somewhat swollen. Pain was increased by exercise, and entirely relieved by rest. This condition persisted for five or six weeks, when she consulted a surgeon in the South of France, where she was then living. A plaster-of-Paris splint was applied, and she was advised to move about on crutches. Marked relief followed, and for the next three months she felt very little inconvenience. When the plaster-of-Paris was removed, the joint was found to be still swollen, yet not more than when the splint was first applied, and it was cool and painless. As it was stiff, it was moved while the patient was under an anæsthetic. This proceeding was followed by swelling, pain and heat. The plaster-of-Paris splint was thereupon re-applied, and the rest-treatment resumed. A month later the patient passed into the hands of another surgeon, who finding that no active symptoms were then present, removed the plaster and ordered massage.

This treatment was followed by increasing swelling and so much pain, that at night the patient had little sleep. She now determined to return to England, and for the purpose of the journey the limb was carefully enclosed in a silicate bandage. On seeing her directly after her arrival, I found the following conditions present. The knee was flexed to an angle of about 140° . The joint was uniformly enlarged, as the result of synovial swelling. There was marked local heat, and the body-temperature, normal in the morning, was 101° at 6 P.M. The patient looked worn and distressed, and said she was much disturbed at night by pain in the knee.

There was no enlargement to be detected in the ends of the bones.

This case presented all the usual features of a somewhat active tuberculous synovitis with erosion of cartilage, and there was nothing to suggest any other diagnosis. Leather splints were applied and the patient was confined to her sofa. No improvement followed. Pain was not materially relieved, and swelling and surface heat continued. Six weeks later, and about nine months after the disease was first observed, fracture occurred through the femur immediately above the condyles. This fracture took place, so to say, quietly, and was detected only when it was seen that a marked change had occurred in the outline of the limb, just above the patella. Even, then, however, no irregular or tuberous swelling could be detected—but only such uniform enlargement as might easily be ascribed to a somewhat extreme degree of pulpy thickening of the synovial membrane and the sub-synovial tissue. An exploratory operation was now performed, and the true nature of the disease ascertained, and the limb was at once amputated. On subsequent examination an endosteal sarcoma, of a mixed round and spindle-celled structure was found to have occupied almost the whole of the cancellous tissue of the condyles, but not to have so far expanded the bone or to have extended beyond it, as to produce material enlargement of it, or alteration of its outline.

CASE II.—In a case of periosteal sarcoma of the lower end of the femur, projecting chiefly on the inner side, the tumour after attaining considerable size, and leading to effusion into the knee-joint,

broke down and formed a large elastic swelling, so as to imitate advanced tuberculous synovitis, with suppuration above and to the inner side of the joint. The patient, who was aged twenty-six, was in a parish infirmary, and was believed to have tuberculous disease of his knee, of six months standing. The joint had been swollen, and no enlargement of the femur had at first been observed. Then, as his temperature was 102° to 103° each evening, and as an elastic swelling was found on the inner side of the limb just above the knee, it was believed that suppuration had occurred. When, however, the patient was sent up to the hospital it was found that the lower part of the femur was enlarged above the condyles, while the condyles themselves were apparently normal—a very unusual condition of things in tuberculous disease of the femur spreading to the knee-joint; for when the joint is affected as the result of extension from the bone, the primary mischief is situated in the cancellous structure of the condyles. Secondly, it was observed that although the swelling on the inner side of the limb was very elastic, it was not the seat of true fluctuation. It was therefore strongly suspected that the disease was malignant. A few days later, when the swelling was explored, it was found to be sarcoma, into the substance of which hæmorrhage had taken place. Amputation of the limb was therefore performed. In this instance, as in some others I have seen, swelling of the knee-joint dependent on a growth in the femur, has been accompanied by swelling and pitting on pressure of the leg—no doubt from venous and lymphatic obstruction. This

œdema of the parts below the knee is very rare in tuberculous synovitis, and is therefore a symptom which may well add, though with no great force, to the suspicion that a growth is present.

CASE III.—A young lady, aged eighteen, began to have pain in her left knee after playing tennis, and there was some swelling of the joint and tenderness over the inner tuberosity of the tibia. The disease was regarded as tuberculous, and the patient was sent to the seaside, wearing leather splints, and with directions to rest the limb. No improvement took place, and on her return, three months later, an incision was made over the head of the tibia, but only blood escaped. Four months afterwards I saw the case. There was considerable swelling about the head of the tibia, but this had all the appearance of being due to tuberculous osteitis, and with this view the marked swelling of the synovial swelling, pain, and a raised temperature seemed to correspond, yet on exploring the tibia a sarcoma was detected growing within the bone and now extending into the superjacent structures.

CASE IV.—A boy, aged thirteen, had swelling of the lower end of the humerus, with pain, heat of the surface and swelling and stiffness of the elbow. The condition was regarded as tuberculous osteitis of the end of the bone, with secondary inflammation of the joint. A splint was applied and the limb kept at rest. At first both pain and swelling diminished, but soon both again increased, and the body temperature was 102° at night. The lower end of the humerus was then explored; no sequestrum or pus was found, but

nothing was observed to raise a suspicion that the case was really sarcoma. It should be added that the operation was performed by a hospital surgeon. I saw the patient three months later; the limb was in a splint; there was considerable uniform enlargement of the lower fourth of the humerus. No irregular or tuberos swelling was present. The joint was somewhat swollen and the synovial membrane had the usual appearance of being the seat of tuberculous disease. The arm was much wasted. The wound made in exploring the bone was nearly healed, but some suppuration and discharge of ordinary-looking pus were present. I had no suspicion as to the diagnosis which had already been made. There were no sign of projection of growth at the seat of the wound. The condition seen was merely that of an unhealed sinus. Treatment by rest was continued, but there was no improvement in the symptoms, and it was soon obvious that the bone was somewhat rapidly enlarging on the inner side. It now came to be suspected that sarcoma was present; and when an exploratory operation was performed a few days later this was found to be the case. The limb was at once amputated. This was nine months after the first symptoms were observed.

The boy remained well for three years. Then his health failed, and he died with secondary deposits in the internal organs four months afterwards.

CASE V.—A lady, aged twenty-one, felt pain and noticed slight swelling in her left knee after playing tennis. These symptoms continued, in spite of rest, and she could walk only a short distance without

becoming lame. The case was regarded as of doubtful origin, but there seemed no ground for anxiety, and she was sent to a health resort and treated for osteo-arthritis, by douching and massage. Pain, however, became severe, after both gentle exercise and massage, swelling increased, and the surface of the joint became warm. The disease was now regarded as tuberculous, and she was advised to return home. Those who had previously examined the joint saw that evidence of serious disease had become much more marked. The joint was considerably enlarged, hot, and very painful on any attempt at movement. But there was no enlargement of either of the bones, and the swelling was uniform and apparently due to tuberculous synovitis. The temperature, normal in the morning, was constantly 102° or 103° in the evening. Sometimes pain was slight, but at others—especially if there had been any disturbance of the limb—it was so severe that the patient could obtain scarcely any sleep. Another surgeon was consulted, and his opinion was that the disease was tuberculous, attended with extensive thickening of the synovial membrane; and as the temperature was so markedly and persistently raised, the surface hot, and the skin engorged and dusky, it was thought very probable that suppuration would not be long delayed.

. Absolute rest, secured by a carefully fitted poroplastic splint, was maintained. But little change occurred in the next two months. The joint continued slowly to enlarge, apparently by increasing thickening of the synovial membrane; the former temperature was maintained; pain, usually moderate, was provoked

by any movement of the limb, and the skin was thickened and dusky. I now first saw the case. It appeared to me to be an example of tuberculosis of the synovial membrane, in no way different from many other cases, except that the synovial membrane was so greatly thickened, and the surrounding soft parts so brawny that the knee was of a somewhat unusual size. Yet I had seen other tuberculous cases in which the joint was quite as big as this. Prognosis, however, must evidently be unfavourable, and some operative interference would probably be necessary. A month later so much enlargement had occurred on the inner side of the joint, that the limb had the outline of marked knock-knee, and the tissues over this swelling were œdematous and the skin dusky and hot; and as the temperature was still 103° at night, it was believed that suppuration was taking place. An operation was therefore recommended, and leave to remove the limb, if necessary, was obtained. When the swelling on the inner side of the joint was cut into it was found to be due to a growth which was beginning to break down. Amputation was performed.

Dissection disclosed a periosteal sarcoma of the inner condyle of the femur. This had extended into the bone, and had also invaded the synovial membrane, which was in some parts an inch and a half in thickness and heaped up into a large fleshy mass; the articular cartilage of the internal condyle was destroyed.

CASE VI. *A case of Primary Sarcoma of the Synovial Membrane of the Knee-joint.*—Alfred B., *æt.* twenty-one, was admitted under my care in

St. Bartholomew's Hospital, in September 1892, for a swelling on the inner side of the left knee. For eighteen months he had felt pain in the knee and down the inner side of the leg. The swelling, which had existed for fourteen months, was seated over the inner condyle of the femur, close to its articular border. It was firm and somewhat elastic, distinctly circumscribed and prominent, and about the size and shape of a small flattened Tangerine orange. The situation and physical characters of the swelling made its nature very doubtful, but it appeared most likely, on the whole, that it would prove to be due to tuberculous periostitis of the condyle of the femur, with infiltration and thickening of the adjacent structures. On cutting into it, however, I found it was a new growth entirely unconnected with the femur, and springing from the sub-synovial tissue of the joint. It was freely removed by cutting it out, together with a zone of surrounding synovial membrane. By this proceeding a large opening was made into the joint on the inner side of the patella. The wound healed by primary union. On microscopic examination the swelling was found to be composed mainly of spindle, but with some admixture of round, cells.

In December 1894 the patient was again admitted, complaining of pain in the knee. There was a good deal of muscular wasting, and the joint was somewhat stiff. No return of the growth could be found. The pain was believed to depend on adhesions, and the joint was moved under gas, with the result that the pain ceased. In March 1895 he was in again with a recurrence of the pain, and with limitation

of movement, and a growth as big as a large marble was removed from the upper end of the original scar. This had the structure of a spindle-celled sarcoma.

In December 1895 he presented himself again, with a return of his pain. A nodule of growth the size of a small walnut was removed from the sub-synovial tissue to the outer side of the joint, the whole thickness of the synovial membrane being cut away over an area of about an inch in diameter, and some of the adjacent part of the external condyle was also removed. In January 1896 a small nodule was removed from the lower part of the original scar on the inner side of the joint, but on examination this was found to consist merely of fibrous (cicatricial) tissue. It contained no recognisable sarcomatous elements. In August 1896 two small nodules of sarcoma were removed from the inner side of the joint, and in March, and again in October 1897 small masses of similar structure were detected and removed. In December 1897 the patient came to the hospital again, with what appeared to be a recurrence in the posterior part of the joint. In this situation a deep-seated swelling, apparently as big as a large walnut, could be felt projecting backwards. This had displaced the popliteal artery, so that it was pulsating close beneath the skin. There was marked muscular wasting, the knee was stiff, and the patient complained of severe pain extending down the limb. There was no affection of the femoral glands. As there was clearly a recurrence of the growth, and as the limb was now almost useless, I performed

amputation through the middle of the thigh. On examining the joint a growth as large as a bantam's egg was found springing from the synovial membrane at the back of the joint, and there was a second but smaller process which extended forwards into the joint, between the condyles. These growths, like those previously removed, presented the microscopic structure of a spindle-celled sarcoma, with some small round cells here and there.

This case is one of great rarity. I have not myself met with any other instance of the same kind. The original disease was limited entirely to the synovial membrane, so that, as I have said, it was removed by cutting a large window in the side of the joint. It had no connection whatever with the periosteum or bony portion of the condyle of the femur, and in each recurrence it appeared to involve only the synovial membrane or the sub-synovial tissue. The history of the case was remarkable. In a young adult sarcoma generally grows rapidly, shows a marked tendency to recur quickly after removal, and is often followed by secondary deposits in the internal organs. Here, however, the original disease recurred only after an interval of more than two years, and although the disease extended, in all, over a period of more than six years, with five recurrences, no secondary deposits were developed. And the method of local recurrence was very unusual. The original growth was limited to the synovial membrane on the inner side of the joint. But after one recurrence in this situation the growth made its appearance on the outer side—not, it appeared certain, by direct extension, for the disease

had been freely removed on the inner side, and the scar there remained quite healthy ; and, moreover, when the growth on the outer side was exposed it was found to be an isolated mass, entirely limited to this situation and quite unconnected with any extension from the inner side : while after its removal no recurrence of disease ever occurred on the outer side, nor was there recurrence on the inner side until nine months later. But, further, while the inner and outer parts of the joint were still free from any renewal of the growth, a mass sprang up at the posterior part of the joint, and grew backwards into the popliteal space. In fact, in the course of the six years over which the disease extended, it seemed to spring up in different districts of the synovial membrane, not by extension from its original site, but by independent developments. The case, I hope, is of some value as a contribution to the history and development of sarcoma. It not only records the growth of sarcoma in a very unusual situation, but it shows how widely the course of the disease may differ from that with which general clinical experience has made us all familiar.

In some cases a new growth closely imitates tuberculous disease of the hip-joint.

CASE VII.—A girl, aged thirteen, was sent to the hospital as a case of hip disease, for she was lame, and had marked pain in the joint and down to the knee. Wide movements of the limb were restricted, there was some apparent lengthening and distinct muscular wasting. On examination I found that although all these symptoms strongly suggested hip disease there was one fact which threw a very

strong doubt upon this view, namely, that the movements of the joint, including rotation were, within certain limits, quite free. On what the symptoms really depended, however, seemed very doubtful, and this doubt continued for three months, when enlargement of the femur close up to the neck was detected and the case proved to be one of sub-periosteal sarcoma, at the level of the trochanters. The patient died (amputation having been declined) four months later.

CASE VIII.—In 1893 I saw a patient, aged twenty-three, who had, as it appeared, early tuberculous disease of his hip. The limb was flexed, abducted, and everted; pain extending to the knee was severe, the movements of the joint were restricted, and there was marked muscular wasting. Shortly afterwards, however, a firm, inelastic swelling was noticed in Scarpa's triangle and extending into the adductor region, and it soon became evident that the case was one of sarcoma of the upper end of the femur. As the disease advanced pain referred to the thigh, and the knee became so severe that morphia injections were frequently necessary. In another case (Case IX.), a patient, aged nineteen, was believed to have hip disease, as the joint appeared stiff, and pain down the limb to the knee was constant and severe, and often increased by spasmodic muscular contraction. On examination, the first impression was that the case was one of early and very acute hip disease. But when the limb was gently flexed to a right angle with the trunk, it was found that the head of the femur rotated with perfect freedom, though through a limited range, in the acetabulum. And further search discovered an enlargement of the descending

ramus of the os pubis, of the size of a bantam's egg. This proved to be a sarcoma. It increased in size and produced severe pain by pressure on the obturator nerve. In three months it was as large as a closed fist. The patient died five months later of secondary deposits in the internal organs.

Diagnosis.—The difficulty in arriving at a correct diagnosis depends, obviously, on the fact that those symptoms which attend new growths involving the joints are so similar to as to be nearly identical with those which are met with in tuberculosis of the bones or synovial membrane. At first, in both cases alike, the affection advances slowly and insidiously, and often without pain. Later, the swelling which is developed in the one may be indistinguishable from that which supervenes in the other. Pain, absent at first, may, when the disease is sarcoma, be, so far as I have seen, precisely similar to that produced by tuberculosis—absent or very slight when the limb is at rest, produced or increased by movement; referred to the same situations as in tuberculosis, occasionally provoked by spasmodic startings of the limb, such as occur when the bone beneath the articular cartilage is inflamed (subchondral caries). No doubt the outline of the parts is in many instances of sarcoma, one of asymmetry, so that enlargement involves only one aspect of the joint, or the swelling tends to fill up the popliteal space, or to present a lobed or tuberos surface; or where there is enlargement of the lower end of the femur, this, instead of gradually subsiding as it is traced upwards, comes abruptly to an end by a distinct prominent boundary, immediately above which the shaft is of its normal size.

Yet in many cases the swelling due to sarcoma closely resembles that which results from tuberculosis. It is fusiform, gradually tapering, and smooth. In the temperature, whether local or general, nothing is found which can be depended upon for differential diagnosis. The body temperature may all along be normal in both. On the other hand it may, in both, be habitually raised. In some examples of sarcoma the temperature is 101° in the morning, and 102° or 103° or even more, in the evening, so that the chart closely resembles the chart of a case of tuberculosis when suppuration is impending or has already supervened. The local temperature in sarcoma, as in tuberculosis, may be normal; but in cases in which the disease is advancing quickly, or in which the growth is very vascular, the surface is always distinctly over-warm, as it is in a case of active tuberculosis.

In a considerable proportion of cases of sarcoma no enlargement of the lymphatic glands can be detected. Yet their condition should be carefully investigated in every case in which, though apparently tuberculous, there is a possibility that the disease may be sarcoma. Should the glands be found to be enlarged a strong suspicion of sarcoma must arise, and it would be advisable to remove one of them for careful microscopic examination. There are two other points which, though they afford no conclusive evidence, are yet worthy of notice. In the first place muscular wasting, though it undoubtedly occurs, and may be very marked in sarcoma, yet is often only trivial; it is distinctly less than that which is constantly present when tuberculosis has existed for even as long as two or three months. So

that the absence of wasting (tested both by critical measurement and by palpation—to gauge flabbiness) would be suggestive rather of sarcoma than of tuberculosis. Secondly, in sarcoma the limb shows no tendency to become flexed, as is frequently the case in tuberculosis, involving a joint. The presence of other evidences of tuberculosis should, of course, be noted, and the family history inquired into. Yet such evidence must be allowed no undue weight. For instance, a patient who died of sarcoma of the spine had lost a brother by tubercular meningitis, and another patient who had sarcoma involving the knee joint had also phthisis.

Thus, as I remarked at the outset, in the diagnosis between sarcoma and tuberculosis involving the joints, no single symptom, or any group of symptoms, can be entirely depended upon. The only course open to the surgeon is to bear constantly in mind that the question is surrounded with difficulty, and that the only prospect of escaping serious mistakes lies in the collection and critical consideration, both in itself, and in its relation to all the rest, of every symptom that is present, and in frequently revising the diagnosis which has been provisionally arrived at, by the help of new symptoms or the more clear characteristics which those already noted may gradually acquire. The suspicion of sarcoma must be increased if the case shows no tendency to improvement when treatment which usually leads to improvement is being carefully employed; for instance, where pain in the spine is not materially relieved by rest (as it usually is in Pott's disease), or where in the case

of a knee-joint, there is no improvement as to local heat, pain, or swelling, when complete rest is maintained by well-fitting splints. Furthermore, the surgeon must be ready, should there be a growing probability of sarcoma, to perform an exploratory operation. This must be thoroughly carried out, so that the tissues which are the seat of enlargement may be fully inspected. Should doubt still remain, a portion of the structure involved should be removed for microscopic examination (after preparation in the laboratory), and the wound closed. This course is practically free from risk or objection. For, should the disease be tuberculous, an aseptic incision will heal by primary union; while, if it is a sarcoma, the same immediate healing will take place. On several occasions I have cut deeply into the substance of a sarcoma, and have seen the wound heal as quickly and as soundly as if it involved merely the normal tissues of the body. This result—if the essential condition of asepsis is maintained—may be relied on in cases in which the swelling is not so prominent that the deep fascia and skin have become tense. Doubtless, when there is tension, the growth may protrude through the incision, which will constitute the line of least resistance. In such cases, however, no such difficulty of diagnosis as would render an exploratory incision necessary is likely to be present.

The same difficulty of diagnosis may present itself in the spine. This will be sufficiently shown by two or three examples.

CASE X.—A young woman of twenty-four had had pain and stiffness in the lumbar spine, and difficulty

in going up and down stairs for four months, when it was discovered that the spine at the level of the second and third lumbar vertebræ was losing its normal curve and becoming straight. And it was believed she had early Pott's disease. She was therefore confined to bed. Pain, however, continued, and her temperature rose to nearly 102° each night. Deformity of the spine continued to increase, and a large elastic swelling formed in the right iliac fossa. The swelling was regarded as an iliac abscess. I saw the patient a month later, and six months after the first symptoms had been observed. She then had well-marked, but rounded rather than angular curvature—as if two or three vertebræ were concerned—and her right iliac fossa was filled up by a large swelling, which was highly elastic. A few days later the iliac swelling was opened in the belief that it was produced by an abscess resulting from Pott's disease. It proved, however, to be a sarcoma, which, as the result partly of softening, partly of hæmorrhage into its substance, had become diffuent. The patient lived only a few weeks, and at the *post-mortem* examination it was found that the bodies of the first three lumbar vertebræ were almost entirely destroyed by a round-celled sarcoma.* Some years ago I met with an almost exactly similar case; while in a third, a patient had all those symptoms which are reputed to indicate Pott's disease, and two highly elastic swellings in the gluteal regions, which were regarded as abscesses making their way out through the great sciatic foramina. One of these swellings was

* This case has been already mentioned, pp. 182-3.

opened for an abscess, but was discovered to be due to a sarcoma. After death a mixed-celled sarcoma was found springing from the lower lumbar vertebræ and partly involving the sacrum. Mr. Rickman Godlee has told me that he has met with a very similar case.

CASE XI.—A girl* of six had the symptoms usually taken as those of Pott's disease in the cervical region, and a deep-seated elastic swelling appeared in the right sub-occipital region, which there seemed no reason to doubt was an abscess. When it was opened, however, it proved to be a sarcomatous growth. After death, which occurred in about two months, the left halves of the three upper cervical vertebræ were seen to be almost entirely destroyed by a mixed-celled sarcoma.

This difficulty of diagnosis between Pott's disease and malignant growths of the spine depends on various circumstances, of which the following are the most important. In the first place, in many instances the objective symptoms of the two conditions are often absolutely identical. That which to look at is in every feature which it presents Pott's disease, may be not this but malignant disease. In the early stage, deformity may, of course, be absent in both conditions. And the same is still true when the diseases are each of longer standing. In Pott's disease because, in some instances, the tuberculous process takes the form of periostitis, with but little tendency to break down the cancellous tissue of the bodies of the vertebræ; or because, in adult life, the framework of the vertebral bodies is constructed of

* Author's "Diseases of the Joints and Spine."

very compact and hard bone, so that, though the greater part of the cancellous tissue is destroyed and little more than a shell remains, this is so strong that it does not yield. In malignant disease deformity may be delayed because pain is so severe that almost from the first the patient is confined to the horizontal position, or because (as in two of the cases related above) the disease involves not one but many vertebræ, so that no yielding at any particular level occurs, but the whole spine yields in a kyphotic curve as if from mere muscular weakness.

It is only when the age of the patient is noted and the symptoms critically studied that a correct differential diagnosis can be arrived at. The age is important. If the patient is a child the very strong probability is that the disease is tuberculous and not malignant. I have only three times seen malignant disease of the spine in a child. One has been already mentioned. In the next the disease was secondary to sarcoma of the testis in a boy of seven, in whom wide diffusion of the growth had occurred. The nature of this case was obvious from the first, and it is unnecessary to give any details. The third case is worth attention, not only on account of its rarity, but because the diagnosis was attended with great difficulty. The patient was a girl of eight. The family was strongly tuberculous, but a brother had died of sarcoma of the liver at the age of seven. The first symptoms in the girl consisted of pain in the lumbar region, hips, and legs, with muscular weakness, and disinclination to take exercise. On examining the spine a month after the illness began

I found it was stiff in practically its whole extent, and that pain was produced by any attempt to move it. There was no curvature. The temperature was 102° , and the child looked pale and distressed, and was losing flesh. On what these symptoms depended it appeared not possible to say, but, on the whole, it seemed most likely that the disease would prove to be tuberculous. Loss of flesh and strength continued, and pain in the lower limbs became severe. A month later the child had incontinence of urine and paralysis of the sphincter ani, and, in spite of every care, a bed-sore formed over the sacrum. This extended, and the bone became widely exposed. Complete paraplegia came on, and death occurred six months after the disease began. On *post-mortem* examination the bodies of all the vertebræ, from the third dorsal to the second lumbar, were infiltrated with a mixed-celled sarcoma, and there were secondary deposits in the lungs, liver, and other parts.

CASE XII.—A case which closely resembled the foregoing was recorded, in 1889, by Dr. Lewis Jones in the St. Bartholomew's Hospital Reports.* A girl of nine was admitted under Dr. Gee, with very obscure symptoms—pains in the right hip and knee, a small quantity of albumin in the urine, and a temperature of 101° . In a week pain had ceased, and the temperature was normal. A few days later, however, she had pains in various parts of her body and in her limbs; she was very weak, and the temperature was 103° to 104° . The spine was included in a very careful general examination, but nothing was detected. In the ensuing few weeks she wasted

* Vol. xx. p. 225.

rapidly, and began to pass her urine involuntarily. Soon there was complete paraplegia, and severe pain was always felt in the left leg. To move her in bed caused severe pain. A large bed-sore was developed. The patient died three months after the illness began. After death the bodies of all the vertebræ from the fourth dorsal downwards, and the sacrum and the iliac portion of both the innominate bones were infiltrated and broken down by a small round-celled sarcoma. The growth also involved the sternum and several ribs.

Thus, though in children tuberculous disease of the spine is infinitely more common than malignant disease, the latter, as the cases just related show, is occasionally met with. In adults, particularly when middle life is reached, the probabilities are reversed. The disease may be tuberculous, but it is more likely to be malignant. For, in the first place, sarcoma of the spine is about as common as tuberculosis in persons over forty; while carcinoma, secondary to primary disease in the breast, œsophagus, uterus, and other organs is certainly more frequent.

Pain is a symptom which may furnish important information. In Pott's disease it is, in many cases, almost or entirely absent, while when it is present it is rarely severe, and immediately or very soon subsides when the patient is confined to the horizontal position. In malignant disease of the spine, on the other hand, pain generally attains an altogether different degree; it is not only severe, but intense, and it is often paroxysmal and increased to an agony on movement. Nor does it in any

material degree subside when the patient is kept in the horizontal position. In two cases the pain was such that frequent hypodermic injections of morphia were necessary in order to procure the patient even temporary and partial relief. As Sir William Gowers remarks,* it was this character which made Cruvelhier describe the disease as *paraplegia dolorosa*. Pain may be complained of in the spine itself or be referred to the peripheries of the nerves which leave the spine at the level of the growth, and these areas are often the seat of hyperæsthesia. As to paralysis, the contrast is very marked, and should be fully born in mind, between Pott's disease and new growths. In the former paralysis is rare; and although it may occur in disease of the cervical or lower dorsal region, it is chiefly met with when the disease is situated in the upper dorsal vertebræ—that is between the scapulæ. In new growths paralysis is very common, indeed it is seldom absent except in the early stage. In some cases complete paraplegia comes on in a few hours, or even quite suddenly; in others the loss of power is gradual. Or one limb, or even a single group of muscles may be involved in the first place. In one instance paralysis of the left lower limb was found to have occurred in the hour during which the patient was asleep in the afternoon. In another, paralysis of the peronei of one leg was present for four days, and was then followed by rapid paraplegia. Another form of paralysis which is of very common occurrence is that of the sphincter ani and of the bladder, so that the patient has retention, and afterwards overflow of

* "Diseases of the Nervous System," 1884, vol. i. p. 180.

urine and incontinence of *fæces*. This conjunction of severe pain, which is often paroxysmal and unrelieved by horizontal rest, with the advent of paralysis must be regarded, if not as absolute proof, yet as a very strong indication that the patient has malignant disease. Scarcely a doubt will remain if paralysis extends to the abdominal and intercostal muscles. Another indication of malignant disease is the formation of bed-sores. In Pott's disease these are avoided by good nursing: indeed, there is but small likelihood that they will be developed. In malignant disease they form and extend in spite of every precaution and every care that can be taken, while in many instances nursing will be rendered still more difficult by incontinence of both urine and *fæces*.

NOTE.—Angular curvature is by no means always produced by Pott's disease. It may be due, in addition, to malignant disease, fracture-dislocation, and, however rarely, to destruction of the vertebral bodies by the growth of hydatids. I have seen it rapidly produced in a child of eighteen months, by infantile scurvy, in the course of which the body of one of the dorsal vertebræ had been broken down by hæmorrhage into its cancellous tissue—a result similar to that which is not uncommon in the ends of the long bones and which leads to the complete separation of the epiphysis from the shaft. It is a current opinion that angular curvature is produced by aneurysm of the aorta leading to absorption of the bodies of the vertebræ by pressure. I have myself never seen this, and I know of no specimen in illustration of it. Usually the irritation caused by the extension of the aneurysm leads to the formation of new bone and ankylosis, and the development of plates and stays by which, though mere shells, the vertebræ are prevented from undergoing any angular displacement.

ON THE ASSOCIATION OF SUPPURATION WITH MALIGNANT DISEASE.

I HAVE met with several instances in which a malignant growth has been complicated by inflammation going on to suppuration, and, on the other hand, with two cases in which malignant disease was developed in tissues which had for some time been involved in suppuration. Such unusual combinations deserve to be recorded. Besides being noteworthy in their pathological aspect, they are important clinically, since they are likely to occasion serious mistakes and oversights in practice. But, by way of preface, I may refer to an allied subject, which, though it has no claim to novelty, will yet bear a passing notice. I mean the difficulty that occasionally presents itself of determining whether a given swelling depends on malignant disease or abscess. Two or three cases in illustration will be sufficient.

CASE I.—*Sarcoma of the Kidney simulating Abscess.*—A child, aged nine, in the Hospital for Sick Children, had a large swelling in the right loin, evidently connected with the kidney. It filled the space between the last rib and the iliac crest, and extended forward nearly to the middle line. It was smooth and rounded on its surface, and so soft and elastic on

pressure, that to all but very careful examination it appeared to present well-marked fluctuation. The physician in charge of the case regarded it as one of perinephritic abscess. The child's temperature ranged between normal and 102° . On the introduction of an exploratory needle connected with an exhausting syringe, nothing but blood was obtained, and the swelling proved to be a large sarcomatous tumour, connected, as a *post-mortem* examination six weeks later disclosed, with the kidney. The fact that, although the case was one of malignant disease, the temperature was considerably raised, is alluded to at p. 246.

CASE II.—*Carcinoma of the Liver simulating Abscess*.—I was requested to see a man in one of the medical wards at St. Bartholomew's Hospital, suffering, as was believed, with abscess of the liver. He was forty-three years of age, and had been a soldier long stationed in India. I found the liver considerably enlarged, so that it reached three inches below the ribs, and projected far down in the epigastric region. In this situation it formed a prominent swelling, which had exactly the appearance of an abscess that was pointing. It was very soft and yielding, so that it seemed to fluctuate, and the skin over it was dusky red. I had no suspicion that it was anything but an abscess. When the swelling was incised, however, only blood escaped, and it became clear that a growth was present, and it was subsequently demonstrated by *post-mortem* examination that the disease was cancer of the liver.

CASE III.—*Sarcoma of the Testis simulating Abscess*.—A man, aged twenty-five, was under my

care at St. Bartholomew's Hospital for an affection of the left testis, which he stated had followed a blow three months previously. The testis was somewhat larger than a duck's egg, globular, and smooth on the surface anteriorly, but behind irregular and hard, as if from inflammation of the epididymis. The skin over it was ruddy and thickened, as if loaded with effusion. The body of the testis was so soft and elastic as strongly to suggest fluctuation. The cord was clear; there was no enlargement of the lumbar glands. On exploring the swelling, I found that only blood escaped, and it ultimately proved that the disease was malignant. A few days later I removed the gland.

In these cases the error of mistaking malignant disease for abscess arose chiefly from the fact that the tumour had, by breaking down, become so elastic that its elasticity was mistaken for true fluctuation. Such a mistake is no doubt still more likely to happen when not only has the tumour become softened, but when hæmorrhage has also occurred into its substance. It may then be as diffuent as softened brain matter, and on manipulation its physical characters will be indistinguishable from those of a collection of fluid. Another source of error in Cases II. and III. was that the skin had become, as the disease approached the surface, dusky and altered, just as it is when matter is pointing. In such cases as these there are three points, attention to which will generally obviate a mistake in diagnosis. First, although the most prominent part of the swelling is as elastic as a collection of pus, there are in many instances other parts in which a well-defined salient

edge of the tumour, or even its distinctly lobed or nodular outline, can be detected—an outline sheer and abrupt, and quite unlike the gradual transition from inflammatory induration to healthy soft parts beyond. Secondly, although the first impression on handling the swelling is that it really fluctuates, a more critical examination will show that, however elastic it is, there is no true to-and-fro displacement in response to the alternate pressure of the fingers of the two hands—in other words, no true fluctuation. Thirdly, in a doubtful case no definite opinion should be ventured upon until the swelling has been fully explored.

CASE IV.—*Carcinoma of the Breast simulating Abscess*.—In a lady, aged thirty-four, who had been confined four months before, and who was still nursing her infant, the right breast became large, hot, tense elastic, and painful, and the skin over it was ruddy and cedematous, as if occupied by inflammatory exudation. The surgeon who was attending the patient believed that an abscess was in course of formation, and ordered that the breast should be poulticed; and it was not till three weeks later (at about the time at which I first saw her) that the real nature of the case was declared by the appearance of numerous cancerous nodules in the skin, and the rapid enlargement of the axillary glands. The mistake here arose first because all the circumstances of the case suggested the probability that the breast was the seat of an abscess, and, secondly, because, owing to the comparative youth of the patient, and the vascularity of the breast depending on lactation, the malignant growth was very active, and attended

with great vascular disturbance, leading to redness of the skin, and to tenderness and local heat. When I saw the case, setting aside the presence of cancerous tumours in the skin, and the enlargement of the glands, its likeness to a deep-seated abscess was complete.

Just as malignant disease may be mistaken for abscess, so may abscess be mistaken for malignant disease.

CASE V.—*Abscess of the Breast simulating Carcinoma*.—A woman, aged forty-four, noticed that her right breast was undergoing enlargement; but this change was accompanied by no sense of heat or throbbing and was very slow in its advance. Two months later she came to St. Bartholomew's Hospital. On examination, I at first thought the case was one of scirrhus. There was a circumscribed swelling of the size of a hen's egg situated in the upper and outer part of a large breast. It was firm, and even hard, and somewhat fixed to the pectoral muscle. The skin over it was adherent. The nipple, the patient said, had shortened, and the axillary glands were enlarged. On further investigation, however, I detected a spot which was soft, and upon which pressure caused sharp pain, and on making an exploratory puncture I drew off some pus. I therefore opened the abscess which the puncture had disclosed. The abscess healed favourably, and the enlarged axillary glands returned to their normal size.

Several cases similar to this one have come under observation, and have shown that when an abscess is of only moderate size, when it is situated deep

below the surface in the mid-substance of a plump breast; when it is surrounded by dense indurated and lobulated mammary gland tissue; when it is subacute or chronic in its progress, and has gradually become tense, and therefore hard and inelastic; when the usual signs of inflammation—heat, redness of the skin, and tenderness—are absent, and especially when the axillary glands are enlarged, nothing is easier than to mistake it for carcinoma, unless an exploratory puncture is made to determine the question.

The brief recital of the foregoing cases will serve as a reminder how closely abscess and malignant disease may resemble each other.

I now pass on to relate the examples I have met with in which malignant disease and suppuration have occurred side by side in conjunction with each other, and to show that while, in such instances, abscess generally occurs as a complication of malignant disease, yet sometimes malignant disease is secondary to, or springs up in connection with, an abscess. In this group, in which malignant disease and abscess are conjoined, the evidences of suppuration, since they are more declared and obtrusive, tend to obscure or completely overshadow those of malignant disease, and thus the latter is very apt to escape notice.

CASE VI.—*Cancer of the Cervical Glands conjoined with Suppuration.*—A man, aged fifty-seven, came to the out-patient room with disease of three months' duration involving the glands along the front of the upper half of the right sterno-mastoid muscle. These glands formed a mass of the size of a small hen's egg.

The mass was for the most part firm, but at one spot, where it was covered by thin, dusky-red, and adherent skin, it was soft and tender on pressure. Besides this principal swelling there was a second just below it, which had the general appearance of mere inflammatory enlargement of a gland. The patient looked prematurely old, and the case closely resembled one of senile tuberculosis in which the glands were beginning to break down. The main swelling, however, was very hard, except at its summit, and immovably fixed by a wide base upon the subjacent structures. These two features suggested that the disease was in reality malignant. A fortnight later, an opening had spontaneously formed at the soft spot already mentioned, and there was a daily discharge of about two teaspoonfuls of well-formed pus, slightly stained by admixture with blood. A week later still, an opening had formed in the lower swelling also; and whenever the dressings were removed, pus drained freely away and ran down the patient's neck. At this time both swellings had assumed unmistakable features of malignant disease, and at the end of another fortnight, while their bases were still hard and fixed, their summits had broken down into large, irregular, cancerous ulcers. The disease, still accompanied with suppuration, now made rapid progress, and at the end of two months the patient died of exhaustion.

CASE VII.—*Abscess associated with Epithelioma of the Jaw*.—A man, aged sixty-one, had an abscess in the right side of the face corresponding to the second lower molar. This was the size of a walnut, and was covered with dusky skin. It looked like an

ordinary abscess resulting from suppuration round a decayed tooth. On further examination, however, I found that he had extensive epithelioma of the gum and the floor of the mouth, which was, he said, of about three months' duration. This patient, like the preceding, was prematurely old, and looked over seventy. He had long been out of work, and had been under-fed for several months during severe winter weather. The abscess, shortly after I saw him, burst and discharged. The epithelioma, which was quite beyond surgical treatment, ran the usual course, and the patient died of exhaustion.

CASE VIII.—*Suppuration associated with Cancer of the Upper Jaw.*—Mrs. W., aged forty-nine, was thought by the surgeon who was attending her to have an abscess in the antrum. There was considerable swelling of the face on the left side, which had existed, with gradual increase, for eight weeks. The tissues were indurated, and the skin dusky and suffused. A tooth had recently been extracted. Through its socket pus was escaping freely and a probe could be easily passed up into the cavity of the antrum. Thus it was clear that suppuration was going on, but there was more to be noticed. All the soft parts were infiltrated, brawny, and dusky, and closely adherent to the front of the jaw. The alveolar portion of the bone was rounded and tuberoso; there was bulging of the floor of the antrum towards the mouth, the eyeball was raised and slightly more prominent than its fellow, and the opening leading up into the antrum was bounded by hard rugged tissue, evidently the seat of cancerous ulceration. The patient declined any operative

interference, and died in the course of three or four months from extension of the cancerous disease.

CASE IX.—*Abscess complicating Cancer of Pelvic Organs.*—A man, aged forty-two, a heavy drinker, and in every way reckless of his health, had a large ischio-rectal abscess. This was opened, and was soon nearly healed. A fortnight later he had a large collection of pus in the left iliac fossa, and was rapidly losing health and strength. This collection was drawn off with an aspirator, and there was then detected a large deep-seated tumour at the brim of the pelvis, which subsequently quickly increased in size, and caused his death four months later. No post-mortem examination was made, but there was no doubt that the tumour was malignant, and that it had been in course of development for at least some weeks, for when it was discovered on the withdrawal of the collection of pus, it was already as large as a cocoa-nut. It seemed evident that the ischio-rectal abscess and the abscess in the iliac fossa had resulted from suppuration around this mass, though it is not easy to see how the pus had made its way into the former situation.

CASE X.—*Suppuration around Malignant Disease of Larynx.*—A. J., aged fifty-two, had been hoarse for several months. Three months before admission into the hospital, on May 19, 1887, he noticed a swelling around the larynx, which had made swallowing very difficult for two or three days. The swelling was very painful and tender to the touch. After ten days an abscess burst into the larynx, and he coughed up a quantity of foetid pus. Since that date the abscess cavity had from time to

time filled up again, and had been emptied by spontaneous discharge. On admission he was unable to lie down, and his breathing was stridulous and noisy. The soft parts around the thyroid cartilage were thickened and tender, and the superjacent skin was dusky and hot.

On May 21 he coughed up several small fragments of necrosed cartilage. A fluctuating swelling was present in front of the thyroid cartilage, most prominent just to the left of the middle line. On laryngoscopic examination there was great swelling of the right arytaeno-epiglottidean fold and false vocal cord concealing the true vocal cord from view.

June 11.—The swelling in front of the thyroid cartilage had broken, and was discharging pus freely. A warty growth could be distinctly seen on the anterior part of the vocal cord. A fragment of this was removed with forceps, and found on microscopic examination to consist of epithelial carcinoma.

June 15.—Swelling still discharging freely. Dyspnoea was not very marked. He complained of pain in the swelling, but was able to swallow food without much difficulty. He died quite suddenly on the evening of 16th. No post-mortem examination could be obtained.

It is difficult to say what was the nature of the disease at its commencement in this case, whether true epithelioma or a simple papilloma. Probably from the first it was carcinoma. However, its character, when the patient was in the hospital, was placed beyond a doubt by microscopic examination. The suppuration apparently followed inflammation setting in about two months before the patient was

admitted. How the inflammation arose is doubtful. It may have followed necrosis of the framework of the larynx, resulting from the destructive action of the malignant disease—a course of events similar to that observed in Case VII. On the other hand, inflammation may have been developed around the malignant disease (see Case VI.), and have subsequently led to necrosis of the larynx and the separation of the fragments of cartilage which the patient coughed up. The main point, however, is that the abscess in or about the larynx, for which the patient was admitted, was secondary to, and was yet masking, the malignant disease.

In the foregoing group suppuration followed upon and was a complication of malignant disease. All the patients were in a state of depressed vitality. Two were heavy drinkers, some were prematurely old, one was old and feeble, and had been for some time exposed to cold and privation. In such patients the tissues damaged by the progress of the malignant disease would readily undergo septic infection.

Diagnosis.—The variety of the cases just recorded shows that inflammation going on to suppuration may occur as a complication of many forms of malignant disease. It is important to bear this in mind, for otherwise, as the symptoms of inflammation will very generally be more conspicuous than those of malignant disease, the latter is, as I have said above, very likely to escape notice.

In the majority of cases, however, although the symptoms of inflammation are the first to catch the

eye, some of the various features of malignant disease will, if due care is used, be detected in the background. Thus in Case VI., in the first place, the swelling was of almost stony hardness, and, in the second place, closely fixed to the subjacent parts. It thus conformed, in two very telling features, to some of the forms of malignant disease. Either of these signs apart from the other is indeed very suggestive, but when hardness and a solid base are met with together, they ought always to raise a strong suspicion that malignant disease is present.

In Case VII. any one who was content to treat the abscess of the cheek at first sight would have fallen into an error, but he would be without excuse, for the moment the interior of the mouth was examined the existence of epithelioma of the gum would have become apparent.

In Case VIII. close inspection showed that the tubular hole formed by the empty tooth-socket was lined and bordered by rugged and warty mucous membrane, unmistakably epitheliomatous in character, while the neighbouring gum was filled out and irregular, and its surface was coarse and papillomatous.

Treatment.—The treatment of cases where suppuration supervenes as a complication of malignant disease must take both these conditions, and also the circumstances under which they are in progress, into account. In any case in which the malignant growth can be removed—as, for example, in such an instance as Case VIII., in which carcinoma involved the superior maxillary bone—the removal of the disease may be carried out notwithstanding the fact

that suppuration is present, care being taken to protect the surrounding tissues from pus-inoculation as far as possible. The same rule should be followed in a case of combined malignant disease and suppuration of the breast (*vide* Case XII., p. 245).

CASE XI.—*A Case in which Prolonged Suppuration was followed by the Development of Malignant Disease.*—Oliver H., aged sixty-eight, was admitted into Casualty Ward on September 10, 1886, under the care of Mr. Willett, who allows me to report it. His general health appeared good, and he looked much younger than his age. He stated that some five years before, his scrotum enlarged gradually and quite painlessly. The swelling was tapped seven times at long intervals. The fluid drawn off was at first bright yellow, but of late years it had been of a dark brown colour. He was tapped last in May 1886, and the puncture then made had never healed. Since that date the left side of the scrotum had gradually become more painful, and blood with pus had been constantly draining away.

Present Condition.—The scrotum on the left side is now much enlarged and very tender. The swelling is brawny on the surface, but fluctuation can be detected on deep pressure. The left testis cannot be felt. The spermatic cord is much thickened. There is a small opening at the root of the penis, through which a probe can be passed for half its length in a direction downwards; and a second and larger opening at the bottom of the scrotum, through which a probe can be passed for three-quarters of its length. The latter opening, he says, is where he was tapped four months ago. On September 12 an incision

was made into the scrotum, and the condition of the deeper parts explored by Mr. Willett. The tunica vaginalis was found occupied by broken-down and decomposed fibrine mixed with old blood-clot. A drainage-tube was passed through the sinus at the lower part of the scrotum, and warm fomentations were applied.

September 15.—Since the scrotum was opened and drainage provided, the patient has been free from pain. The wound is syringed out daily with anti-septic lotion. There is still some foetid dark coloured discharge.

September 16.—A quantity of broken-down testicular substance escaped from the upper part of the wound to-day.

September 30.—As there were signs of retained pus, the wound in the scrotum was enlarged. The whole of the left side of the scrotum was found in a sloughing condition. Any sloughs that were loose were removed.

October 5.—The patient is doing well. The wound is healthier, and the temperature, which has hitherto ranged between 100° and 102° , is nearly normal.

Shortly after this date it was observed that the scrotum was steadily enlarging, and that some solid material was beginning to protrude at the bottom of the wound. On October 17 a small portion of this growth was removed, and proved, on microscopic examination, to present the structure of a round-celled sarcoma.

October 19.—The scrotum is larger; there is a good deal of purulent discharge, containing a large admixture of blood. On October 27 Mr. Willett

removed the left testis and a wide extent of the superjacent skin, together with several enlarged inguinal glands.

On examination of the parts removed, a large sarcomatous mass was found springing from the neighbourhood of the epididymis and surrounding the testis. The cord was infiltrated for some distance above the testis. The glandular structure of the testis itself was not involved in the disease.

November 3.—Patient is doing well, and the wound is filling up.

November 26.—General health good. A small abscess in the lower part of the scrotum was opened to-day.

November 28.—Some recurrence of the growth is taking place at the bottom of the scrotum, where a firm nodule can be detected. A few days later, as the nodule was increasing in size, Mr. Willett removed it with a wide area of surrounding and apparently healthy tissue.

December 14.—There is now rapid increase of the growth, and the inguinal glands are enlarging and are hard.

December 20.—The patient was anxious to return home, and left the hospital to-day. The recurrent growth was at this time making rapid advance.

The starting-point of the disease in this case seems to have been an ordinary hydrocele. This was tapped several times, and although it is difficult to speak with certainty, as the report of what occurred before his admission into the hospital is derived entirely from the patient, it seems probable that at the last tapping the testis was wounded,

with the result that a hæmatocele was developed. Around this the tunica vaginalis appears to have become inflamed, and to have furnished a persistent discharge, at times purulent, and at times serous, and often mixed with breaking-down blood-clot; fistulous passages were established, and the scrotum on that side became involved in chronic inflammation, attended with brawny thickening of the integument and sloughing of the cellular tissue of the part. At length, in the confines of this area of persistent suppuration, a sarcomatous growth was developed.

CASE XII.—*A Case in which a Malignant Growth was developed in the Floor of an Abscess of the Breast.*—Mrs. G., aged forty-two, sent for admission into the hospital, was reported to have an abscess of the right breast, from which she had been suffering for nearly four months, and which had been opened and drained. It was still discharging, and was attended with considerable swelling. On examination, I found a sinus where an incision had been made. This sinus was discharging thin but healthy pus. Two other openings had spontaneously formed and were also discharging. The deeper part of the breast was the seat of a considerable firm swelling, constituting a distinct irregularly-lobed tumour, which, towards the axillary border of the gland, was covered with dusky and adherent skin, and it was evident that the confines of the abscess were occupied by a new growth. A few days later I removed the tumour and the remains of the abscess cavity. Hæmorrhage was not unusually free. The patient made a favourable recovery. The tumour on examination proved

to consist of a well-marked carcinoma of the size of a small orange.

The patient died nine months after leaving the hospital from recurrence of the disease.

The development of malignant disease in a part that has been the site of long-continued suppuration is, I think, very rare. Cases XI. and XII. are the only instances of which I can relate the particulars, though, no doubt, by further search, some others might be found. The occurrence, however, of malignant disease as the sequel of prolonged inflammation of a less active form is often seen; as, for example, in cases of unsound scars that are frequently the seat of irritation and superficial inflammation, and in cases of syphilitic inflammation of the tongue; while epithelioma of the glans following prolonged balanitis in elderly men when phimosis has been present is not very rare. There is no difficulty in seeing that the much more severe disturbance attending continued suppuration may, when other conditions are favourable, lead to a parallel result.

At p. 230 I have mentioned a case of sarcoma of the kidney in which the temperature ranged between normal and 102° . A high temperature in malignant disease is by no means rare. I have met with several examples of it. In a case of sub-periosteal sarcoma of the femur, the temperature reached 103° . In a boy, aged nine, at the Hospital for Sick Children, in whom it was doubtful whether a swelling of the femur was due to sarcoma or tuberculous osteitis, but which proved to depend on sarcoma, the temperature was 102° . In a case of sarcoma involving the ilium,

in a woman of thirty-two, the evening temperature for some weeks was 103° . Such examples will serve to show that in doubtful cases a high temperature cannot be relied on to prove that a disease is inflammatory rather than malignant.

INFANTILE SCURVY IN SURGICAL PRACTICE.

IN his very able and instructive Bradshaw Lecture, delivered before the College of Physicians, Sir T. Barlow has given a full and clear account of all that is at present known of infantile scurvy, or, as it has been termed, scurvy rickets. As the medical aspect of the affection has been thus completely dealt with, it may be useful to direct attention to this affection as it presents itself in surgical practice. The ground for doing so lies mainly in the fact that, unless care is exercised, there is considerable danger that this condition may be mistaken for something entirely different, and that thus serious errors of treatment may occur. That this should be the case will excite no surprise when it is remembered :

1. That the disease is rare, and that many practitioners have had no opportunity of seeing it.

2. That the circumstances under which it occurs are apt to be misleading, for, as Barlow and others have pointed out, it is not amongst the poor, who generally nurse their infants at the breast, and, later supply them with a mixed, though not in all ways a very suitable, diet, that infantile scurvy is most often met with. It is most frequently seen (where, *primâ facie*, it would be least expected) in the

families of the well-to-do, for in this class some mothers, unable to nurse their offspring, or anxious to escape from the drudgery of doing so, and believing that the various proprietary foods are a complete substitute for breast milk and fresh foods, feed their children for months together entirely on the former set of preparations.

3. That the likeness which cases of infantile scurvy often present to other forms of disease may be, at least at first sight, very deceptive. The following, so far as I have seen, are the surgical affections between which and infantile scurvy diagnosis may be at fault:

1. *Fracture of the Femur*.—A male infant, aged thirteen months, was reported to have fracture of the left femur, for which a long splint had been applied. A large bruise on the hip was regarded as evidence, along with suddenly developed and severe pain in the thigh, that the nurse had let the child fall. There was, however, no fracture, but the child, as indicated by its pale and waxy appearance and spongy gums, was evidently the subject of scurvy. A considerable firm swelling, such as might result from the presence of callus, surrounded the lower end of the femur. This swelling was no doubt produced in the manner described by Barlow. It was due to the osseous material which had been thrown out by the periosteum, after that membrane had been raised by hæmorrhage between it and the shaft of the bone, and was “analogous to what is found round the base of a recovering cephalhæmatoma.”

Although the diagnosis of fracture in this case was erroneous, it must not be forgotten that spontaneous fracture of the shafts of the long bones, though it is

rare, is yet one of the most striking results of infantile scurvy. In a very remarkable instance recorded by Dr. Colcott Fox, several of the long bones presented one or more fractures through their shafts. The preparations from this well-known case are in the Museum of Westminster Hospital. Fracture depends on the weakening of the shaft as the result of hæmorrhage into the medullary canal, and the consequent rarefaction or excavation of the bony tissue. In Dr. Colcott Fox's case, the bones looked as if they had been "broken up by being run over." This form of fracture, involving the shaft of a long bone, must not be confounded with the separation of the epiphyses, which is much more frequently seen.*

2. *Infantile Paralysis*.—A child, eleven months old, was believed to have severe infantile paralysis. Both the lower limbs were so powerless that when the patient was held up they dangled as if completely paralysed. When the child was in bed they remained motionless in a flexed and abducted position. This condition had been suddenly developed about a week previously. The patient was easy when at rest, but when the limbs were moved he screamed with pain. He was pale and cachectic, and had had free nose bleeding twice in the previous fortnight. On examination there was found considerable swelling around both femora and one tibia, the result of subperiosteal hæmorrhage.

3. *Sarcoma of the Femur*.—A child, eighteen months old, was suddenly attacked with severe pain in the right thigh. A surgeon who was called in diagnosed a periosteal sarcoma, which he believed must

* *Path. Trans.*, vol. 38, p. 275.

have been growing for some weeks, but had been overlooked. The view was also formed that the sudden pain and the development of swelling were due to injury, perhaps producing fracture through the growth accompanied by hæmorrhage into its substance.* Two days later, however, examination brought out the following conclusive evidences of infantile scurvy: spongy condition of the gums, multiple "bruises" under the skin, and hæmorrhage under the periosteum of the opposite femur and of both tibiæ.

4. *Sarcoma of the Eyeball*.—An infant, nine months old, had what was regarded as a malignant growth, producing marked proptosis, a condition which it was feared would necessitate extirpation of the globe, and the removal of any growth that might be found at the back of the orbit. On examination, however, all the structures of the eye were found to be normal: and, on widely separating the lids, extravasated blood was to be seen behind the conjunctiva, indicating that hæmorrhage had occurred into the orbit behind the globe in the manner described by Barlow. The child was pale and waxy in appearance, and had a "black eye" † on the opposite side, of which the mother could give no account; while a week before she had been alarmed to find a considerable amount of blood upon the pillow, which she thought had come from the child's throat. The patient was markedly rickety. No teeth had come

* Northrup and Crandall met with a case in which swelling, due to infantile scurvy, was mistaken for sarcoma of the lower end of the femur.

† Oppenheimer mentions a case in which enormous swelling due to hæmatoma of both eyelids was present. *Deutsches Archiv. für Klinische Med.*, Band xxx. 1882.

through, and the gums were free from spongy swelling. In a second case of proptosis and subconjunctival hæmorrhage in an infant in whom new growth was at first suspected, the opinion formed that the case was one of infantile scurvy was confirmed by the result; for under treatment the patient, as in the preceding case, completely recovered.

5. *Sarcoma of the Gums*.—Mr. Pick related a remarkable instance of infantile scurvy, chiefly involving the gums, in his lectures at the College of Surgeons in 1894. The case occurred some years ago, and before the publications of Barlow on the subject. The patient, a male infant aged about twelve months, was suffering from an illness the exact nature of which was obscure. He was so anæmic and emaciated that he appeared to be dying. “The most remarkable feature in the case was the appearance of the child’s mouth. Dark red firm masses, evidently projecting from the gums, protruded from the mouth between the lips. These were very vascular and bled freely when touched. The firmness and vascularity of the growth rather suggested that it might be a case of sarcoma, but the child was in such an extremely exhausted condition that no protracted examination could be made.” Nothing in the way of operative interference could be undertaken, and only palliative measures were suggested. The subsequent history of the case, which, as it is now easy to see, was one of infantile scurvy, is well worthy of being recorded. Two or three hours after Mr. Pick’s visit the mother by chance left a bunch of grapes on the child’s bed. The patient ate one with evident relish; and as it was thought that he was dying, and the grapes

therefore could do him no harm, and as he took them with avidity, he was allowed to suck several others. Next day he was better, and his mother, convinced that the improvement was due to the grapes, continued the treatment. The child now began to take food, and soon completely recovered. Heubner* alludes to a similar condition of the gums, and remarks that in some cases hæmorrhagic tumours of the gums are so large that they hang out the mouth.

Diagnosis.—Should the symptoms observed raise the suspicion that a case is one of infantile scurvy, an inquiry as to the diet which has been employed will throw valuable light upon the diagnosis. If it is found that the infant is being fed at the breast, or is taking a good amount of fresh cow's milk, the suspicion of scurvy is, in all probability, indeed almost certainly, erroneous. But if proprietary foods have been exclusively or even largely used, the probability that the child has scurvy will become very strong. The effect produced by the administration of an appropriate diet † is very striking. In a single day, in some instances, improvement can be observed, and in the course of three or four days the child is obviously well on the road towards convalescence, so that all doubt as to the nature of the illness is at an end.

A case which came under notice in the course of the present year seemed to indicate that infantile scurvy may lead to the development of angular curvature of the spine. In the instance referred to,

* "Jahrbuch für Kinderheilk.," vol. xxxiv. p. 361.

† Barlow, *loc. cit.*

a child aged ten months, who had apparently been suffering with scurvy for nearly twelve weeks, was extremely weak and cachectic. Under the periosteum of both femora and both tibiæ large hæmorrhages had occurred. The lower third of the right thigh was, as the result, so much swollen that it appeared at first sight to be occupied by a large sarcomatous growth. There was considerable swelling of the right leg, and swelling also, though much more limited, of the left thigh and leg. On examining the spine, there was found a very distinct angular curvature low down in the dorsal region. This had appeared in the course of the illness, though at what precise date was not known. The patient died a few days later, but no *post-mortem* examination was obtained. It is therefore impossible to be sure on what the angular curvature depended. It seems, however, not improbable that it was the result of changes going on in the body of one or more of the vertebræ. In the long bones it is well known that the hæmorrhage which collects beneath and widely separates the periosteum, takes place mainly from the rapidly growing tissue of the diaphysis, which lies beneath the epiphysial cartilage. This was very clearly stated by Mr. Pick in his lectures at the College of Surgeons. He says, "the growing tissue at the ends of the shafts of the long bones is in most cases the principal, as well as the primary, seat of extravasation of blood in scurvy rickets in infants." The vascular tissue is often entirely broken down, with the result that the epiphysis is completely detached from the shaft. In Dr. Colcott Fox's case nine epiphyses were separated.

and there were seven fractures involving the shafts of the bones in some portion of their length. It seems reasonable to believe that hæmorrhage may have occurred into the cancellous tissue of the body of a vertebra immediately beneath one of the epiphysial plates, and have broken up the bony tissue in a manner similar to that just described as occurring in the ends of the long bones.

It would appear that surgical interference can very seldom be either necessary or advisable in the treatment of infantile scurvy. It is true the periosteum is often widely separated from the bones by a large quantity of extravasated blood. To some it may seem right that this should be at once removed by free incision and irrigation, or other means. Such a proceeding was, indeed, undertaken in an extreme case by Mr. Herbert Page, and the patient recovered. As a rule, however, to which there are probably few exceptions, no operative treatment should be adopted; for, when the diet of the patient is corrected in the manner described by Barlow, the lesions produced by infantile scurvy are repaired with a readiness which leaves nothing to be desired. In many cases in which an epiphysis has become separated from the shaft it has, as recovery under a corrected diet advanced, become reattached, and complete reunion has occurred.

OSTEO-SARCOMA OF THE HUMERUS

WEIGHING THIRTY-THREE POUNDS AND
MEASURING THIRTY-ONE INCHES IN CIR-
CUMFERENCE; LIGATURE OF THE SUBCLA-
VIAN ARTERY AND AMPUTATION AT THE
SHOULDER JOINT.

THIS case is worthy of being recorded, for the tumour must be one of the largest ever removed together with the upper extremity. The history of the case points to the formation of a cartilaginous tumour in the first instance, and after some years the rapid development in it of sarcomatous tissue.

W. H——, aged forty-nine, a labourer, was admitted into St. Bartholomew's Hospital with a tumour of the right upper arm. He stated that ten years previously he noticed the formation of a hard swelling which felt like bone on the front aspect of his arm close to the shoulder-joint. Having in the course of two or three years reached about the size of an orange, the tumour remained stationary for six or seven years. Two years and a half ago swelling appeared lower down, and grew rapidly, and soon the whole upper arm was enlarged. A year ago the limb measured twenty-five inches in circumference. He had lately lost power and sensation in the forearm, which was now flabby and much wasted. He had lost flesh and strength in the last

month, and during this time the swelling had quickly increased. (See Fig. 26.)

The patient presented an extraordinary appearance. It is scarcely an exaggeration to say that his arm looked at first sight almost as big round as his



FIG. 26.—Osteo-sarcoma of the Humerus weighing thirty-three pounds and measuring thirty-one inches in circumference.

thorax, from which, owing to its bulk, it stood off almost at a right angle. Its circumference at its largest part was thirty-one inches. The forearm by comparison looked small and withered. The tumour was roughly barrel-shaped, irregularly nodulated and bossed, some of the low-crowned nodules being of the size of an orange. The skin over the tumour was.

tense and shining : pale and waxy, from distension over the upper part, but congested and almost livid lower down. A network of large tortuous veins ramified over the surface, and many of them towards the front of the axilla were as big as adult fingers. No secondary growths could be detected. The patient's condition was distressing. The tumour had reached such a size and weight that he found it difficult to balance himself as he walked ; he was obliged to support the swelling so far as he could with his other hand ; he could lie only on his back, suffered considerable pain, looked pale and worn, and was rapidly losing flesh and strength.

On examination it seemed quite possible to remove the arm at the shoulder-joint without any very grave risk to life, for the tumour was engrafted upon the trunk by a somewhat narrow neck, so that the wound left after the amputation would be comparatively small. A few days later the operation was performed. The chief danger to be guarded against was that of hæmorrhage, not only from the arteries supplying the tumour, but from the enormous veins which were seen running over its surface. To meet this danger the subclavian artery was first tied in the third part of its course, and the arm was then elevated so as to empty it of its venous blood. The artery lay at a considerable depth from the surface, for the clavicle was forced upwards out of its normal position ; but as all the tissues around the vessel were natural it was reached without any great difficulty. When the arm was raised the veins—as no blood was now entering—quickly emptied themselves, and thus the limb was rendered, compara-

tively speaking, anæmic. A large skin flap was then dissected up from the upper and outer part of the tumour, the joint was opened and a second flap formed by cutting from within outwards. As the afferent vessel had been already tied and the venous blood emptied back into the trunk, the amount of hæmorrhage was quite insignificant and was estimated at the time not to have exceeded six ounces. No case could show more conclusively the value, in amputation at the shoulder-joint for the removal of large tumours, of the preliminary ligation of the main artery of supply and the draining of the veins. The artery in this instance was deeply placed so that—even if the skin and deep fascia had been divided, as originally suggested by Syme—it could not have been securely compressed, for, in the manipulation of the limb which was necessary during the amputation, the thumb or finger would inevitably have been lifted off the artery and fatal hæmorrhage might have occurred. Besides, it is only when the entrance of blood by the main artery has been prevented that the veins can be efficiently emptied. It was suggested by some who saw the case that the subclavian vein, as well as the artery, should be tied. But there were two considerations which, taken together, seemed to be conclusive against this course. In the first place, ligature of the subclavian vein must always be a more difficult proceeding than ligature of the artery, and the vessel in this case, owing to displacement of the clavicle, was lying at such a depth that I doubt if it could have been safely reached. Secondly, to have tied the vein would have prevented the return of

venous blood into the trunk ; so that, instead of saving loss of blood, it would have largely increased it. In the course of the operation it was found that the skin on the axillary side had become so thin over the tumour that it seemed unsafe to leave it. The flaps were therefore too short to entirely close the wound, but the edges were brought together as far as possible, and the surface left open for subsequent granulation was only about three inches square.

The patient bore the operation well, and his subsequent progress was quite favourable. The wound healed aseptically, and the temperature was never above normal. He was up on the tenth day. When seen a month afterwards he looked well and had regained flesh and colour. He, however, died seven months later of recurrence of the disease.

ON SENILE TUBERCULOSIS AND SUBCUTANEOUS (TUBERCULOUS) ULCERATION.

SEVERAL examples of tuberculous disease occurring in old people have, within the last few months, been under observation in the wards of which I have charge in St. Bartholomew's Hospital. I hope it may be of interest if I briefly relate some of them, and make some reference to the general question of senile tuberculosis. Some discussion appears to be desirable, for although Sir James Paget's original essay on Senile Scrofula was published in 1867, in some of the principal manuals of the present day the subject is not even mentioned, while in others it is referred to in so cursory a manner as to convey the impression that it is of little importance in the practice of surgery. My own experience has led me to believe that the opposite of this is, in reality, the case. The disease in its various manifestations is frequent rather than rare; its early recognition is often difficult; indeed, it is apt to be overlooked by those who regard it as a mere pathological curiosity; prognosis is generally very unfavourable; and the treatment raises questions of considerable gravity from the patient's point of view. Among the cases met with have been the following :—

CASE I. *Large Double Iliac Abscess, probably dependent on Pott's Disease.*—The patient, a man aged seventy years, was admitted to St. Bartholomew's Hospital, with two iliac abscesses of very large size; that on the left side was already pointing, and proved, when it was opened, to contain about two pints of pus. The cavity was scraped and drained. This abscess soon healed. The second abscess was subsequently opened and ultimately healed. The patient was afterwards lost sight of.

CASE II.—A woman, aged seventy-four years, was admitted for an iliac abscess on the right side. Here, as in the former case, there was no angular curvature or other conclusive evidence as to the precise origin of the abscess; but it must be remembered that angular curvature may be absent, notwithstanding the presence of advanced Pott's disease in patients of middle or advanced life. In such patients the vertebræ are so massive and formed of such strong bone that, although excavation occurs, their framework often resists deformity; while in other cases the disease takes the form of a spreading periostitis, and excavation is either absent, or present to a slight extent only. It seemed probable that this patient and the patient in Case I. were suffering from Pott's disease.

CASE III.—Last year a woman, aged sixty-nine years, was admitted into the hospital suffering from spinal disease. On examination she was found to have a very marked angular curvature at the level of the eighth dorsal vertebra. The spinous process of this vertebra was sharply prominent and the column above this point for eight or nine inches was perfectly

straight. The patient said that for the previous twelve months she had suffered from pain in her back and round the sides of her trunk, and that the deformity of the spine had been progressing for nine months. She could now move and walk only with difficulty, and was obliged to lie down the greater part of the day. This patient, who came from a distance, was supplied with a poroplastic jacket and discharged, and I heard no more of her. That the angular deformity in this case was due to tuberculosis seemed clear. The alternative view, that it depended upon new growth—sarcoma or carcinoma—appeared to be negatived by the absence of severe pain, and of paralysis, and also by the period over which the case had extended; for malignant disease of the spine is generally fatal within nine months, and this patient, although her spinal disease had existed for more than nine months, was still in very fair general health and condition.

CASE IV.—The following remarkable case has lately been under observation. A lady aged seventy-two years, a patient of Dr. W. H. Neale, developed what was evidently tuberculous disease of her left ankle. The joint became the seat of a slowly increasing fusiform swelling involving it in all its aspects. The patient was unable to bear any weight upon the foot and the muscles of the calf underwent marked atrophy. In the course of three months suppuration occurred, and in spite of free incision, scraping, and drainage, pus burrowed amongst the tendon sheaths of the deep muscles. Amputation was performed at the junction of the middle with the lowermost third of the leg. The

stump healed favourably, although slowly. A year afterwards the lower third of the left ulna became the seat of extensive tuberculous periostitis, attended with dusky redness and œdema of the skin and considerable pain. A free incision was made and the granulation tissue was scraped away. The wound slowly healed and the patient remained well for three years. At the end of this time her right ankle became involved in considerable swelling, which seemed obviously to depend upon tuberculous synovitis. Within two months the joint had become disorganised, and the ligaments had been so far destroyed that free lateral movement was easily produced. Suppuration occurred, and as the tissues in the lowermost third of the leg were becoming œdematous, amputation was performed six inches above the joint. On dissection the joint was found to have undergone extensive tuberculous disease. The synovial membrane was converted into a thick layer of pulpy granulation tissue. The articular cartilage was almost destroyed, the bones in places were somewhat deeply eroded, and the principal ligaments had in great part disappeared. Microscopic examination showed that the disease was beyond question tuberculous in character.

Having remained well in the interval, the patient two years later, and when she was seventy-eight, complained of pain in the right knee. The joint soon became hot and considerably swollen. In spite of all that could be done the joint became disorganised, and amputation had to be performed. The patient made a good recovery.

CASE V.—There was recently in the hospital a patient, aged seventy-two years, who had been suffering for fifteen months from tuberculous disease of the outer and front portion of the left foot. On examination the metatarsophalangeal joint of the little toe was found to be disorganised and occupied by granulation tissue, and a sinus led into the substance of the external cuneiform bone, which was in a state of rarefying osteitis.

CASE VI.—Two years ago a man, aged fifty-six years, was under treatment for what at first appeared to be osteoarthritis of his right knee. The joint had recently become a little swollen, stiff, and painful. There was some grating on movement, and the muscles of the thigh were markedly wasted. The knee, however, became more and more swollen, the synovial membrane was thickened and pulpy, and the skin over the joint was dusky and abnormally warm. Within three weeks of the patient's admission, and about two months after the commencement of the disease, the joint suppurated, and, in spite of complete rest, went from bad to worse, and was amputated three weeks later. On examination it was found extensively disorganised by tuberculous disease. The synovial membrane was converted into a thick layer of granulation tissue, the articular cartilages were eroded, and reduced to thin wafer-like plates, detached from the bones. The bones themselves were in some parts deeply ulcerated. The patient quickly recovered from the amputation.

Several other examples of senile tuberculosis which I remember to have seen might be related, but it will be enough merely to mention them. A patient,

aged sixty-five years, with tuberculous epididymitis ; a man aged sixty-eight years, with enlarged and suppurating cervical glands ; a man aged seventy-five years, with rapid disorganisation of the wrist joint, requiring amputation ; a woman aged sixty-seven years, with tuberculous caries of the metacarpal bone of the thumb ; a woman aged sixty-two years, with tuberculous disease of the axillary glands, imitating carcinoma ; tuberculous disease of the kidney in a woman aged fifty-eight years, and three cases of spinal caries in people over fifty-five, one in the cervical, and two in the dorsal region.

The symptoms produced by senile tuberculosis are identical with those met with in the more severe examples of the corresponding forms of tuberculous disease in the young, *e.g.*, in tuberculous disease of tarsus in a person aged seventy years, the character, position, and extent of the swelling, the congested and dusky condition of the skin and the appearance of any ulcers that form—all these are indistinguishable from the like features when they are observed in a patient aged ten years. The main difference—needless to say, it is one of great importance—between tuberculosis in the old and in the young is that while in the young, if adequate treatment is adopted early and properly carried out, recovery is the rule ; in the old, in spite of the best known treatment, the progress of the affection is in the majority of cases from bad to worse. In a joint, for example, the synovial membrane rapidly becomes widely infiltrated with tuberculous products, which quickly undergo caseation. The articular cartilage is destroyed and suppuration takes place. This

leads to the formation of large burrowing collections of pus and complete disorganisation of the affected joint, so that amputation is the only course that can be recommended. In other parts—*e.g.*, the testis or the lymphatic glands—early suppuration, with breaking down, occurs. The unfavourable progress in these cases is so constant that I do not myself remember to have seen repair take place in a tuberculous joint in any person over fifty years of age. The disastrous results that will probably follow when one of the large joints, such as the hip, is involved was well shown in the following case, which came under notice five or six years ago. A lady, aged fifty-five years, had tuberculous disease of her hip-joint, which was, for the first few weeks, considered to be, and was treated as, “sciatica.” Afterwards the case was treated with absolute rest secured by a Thomas’s splint and weight extension. The joint, however, grew steadily worse; in two months suppuration occurred, and matter was found both in Scarpa’s triangle and under the tensor fasciæ femoris, and later under the glutei. The limb became rotated outwards and shortened, and at last it became clear that the head of the femur and the upper border of the acetabulum had been absorbed, so that the upper end of the femur could be pushed up and pulled down on the pelvic wall through a range of three inches. Thus this joint within about five months became a complete wreck. The patient died a few weeks later from phthisis and exhaustion. The best treatment, although it will often be found of little avail, is from the first to place the affected joint at absolute rest; to secure the best conditions for

preserving the patient's general health ; to open abscesses as they form, with the most rigid precautions against septic changes in the wound ; and to resort to amputation when it is found that the progress of the case is in a persistently downward direction. Amputation, if means are taken to prevent hæmorrhage, and if an aseptic condition is maintained, will be perfectly well borne in the case of all the smaller joints and often of the knee. In the case of the hip, of course, the idea of amputation cannot reasonably be entertained, nor would excision be a proper step. After amputation has been performed the patient may, as I have several times seen, recover and long maintain perfectly good health. The list of cases of which I have given the foregoing brief account conveys a repetition of Sir James Paget's statement that there are no structures which in the young appear to be "seats of election" of scrofula (or, as would now be said, of tuberculosis) in which the affection is not met with in people over sixty years of age.

Subcutaneous Ulceration.—Another form of tuberculous disease which is seldom, if at all, referred to in the current manuals of clinical surgery is "subcutaneous ulceration"—a name which, like that of "senile scrofula" (now tuberculosis), we originally owe to Sir James Paget. The nature and course of this affection will be most readily indicated by two or three examples.

CASE I.—Two months ago a boy, aged nine years, was admitted into St. Bartholomew's Hospital with a sinus on the inner side of his popliteal space and some ill-defined thickening over the neighbourhood of the internal condyle of the femur. These

appearances suggested that the case was one of tuberculous disease of the lower end of the femur, attended with suppuration. On passing a probe, however, through the sinus, no bare bone could be detected, and, indeed, it was apparent that the probe nowhere passed through the deep fascia, but that it ran easily in various directions close beneath the skin, which, over the most prominent part of the internal condyle, was scarcely thicker than writing paper. The probe also passed in the subcutaneous tissue nearly half-way down the leg, and its point moved horizontally through a considerable area, showing that the skin was widely detached. The nature of the case as one of wide undermining of the skin by "subcutaneous ulceration" was now clear. The whole of the undermined area was therefore exposed by free incision of the skin; the flaps thus formed were raised and turned back; the granulation tissue was thoroughly scraped away with a Volkmann's spoon; the wound was dusted with iodoform, and the flaps were replaced and fixed by sutures. Sound healing by primary union occurred except in the immediate neighbourhood of the original sinus. Here an exuberant crop of tuberculous granulation tissue remained, and a second scraping was necessary. Soon afterwards sound healing took place.

CASE II.—A boy, aged ten years, was admitted some years ago into the Hospital for Sick Children, Great Ormond Street, with three sinuses, three or four inches apart, over the tibia. The orifices of these sinuses were filled with protruding granulation tissue, and their general appearance, together with some swelling of the soft parts, seemed to indicate

plainly enough that the case was one of necrosis of the tibia. On proceeding to operate, however, I found that the deep fascia was everywhere intact; but the subcutaneous tissue for some distance around was converted into granulation tissue, so that the skin was completely undermined. In places it was very thin. Free incisions were made, the granulation tissue was scraped away, and the flaps were replaced and sutured. The wound healed in about three weeks.

CASE III.—A youth, aged eighteen years, was in St. Bartholomew's Hospital two years ago with four sinuses over his occipital region which from their position seemed at first sight to suggest necrosis of the occipital bone. These sinuses had existed for about nine months. On examination it was found that the bone was nowhere exposed and that the sinuses led down merely to the areolar space beneath the occipito-frontalis. The pericranium was quite normal. A probe travelled freely in all directions over a nearly circular area about three inches in diameter. Incisions were made and the scalp over this area was turned up, the granulation tissue was scraped away, and the wound was treated as in the former cases. Healing quickly occurred, and when the patient left the hospital, three weeks later, there remained only three short sinuses, which promised to be soundly healed in the course of a week or two.

The explanation of this particular form of tuberculous disease appears to be the following :—When the tuberculous process is established in the subcutaneous tissue it extends in a horizontal direction, because the subcutaneous tissue is loose, vascular, and easily

invaded, whereas both the skin and the deep fascia, especially the latter, owing to their comparative firmness and toughness, tend to withstand infection. The same fact is illustrated by the ordinary undermining of the skin in superficial tuberculous ulceration. It is illustrated also by the fact that in rodent ulcer the process extends in the subcutaneous tissue farther than it does in the skin itself, so that for the complete removal of this disease it is necessary to cut well beyond the limits to which the skin appears to the naked eye to be involved. In fact, in subcutaneous ulceration, as in other instances, the undermining of the skin is due to the fact that the process of infection spreads most readily in the direction of least resistance.

HÆMOPHILIA IMITATING TUBERCULOUS JOINT DISEASE.

HÆMOPHILIA is often regarded as lying in the borderland between medicine and surgery ; but it is more correct to say that while some of its forms, as they involve internal organs, are wholly medical, others, as for example those which follow accidental wounds or surgical operations, are altogether surgical. Those also are surgical which involve such an organ as the urinary bladder, and such parts as the deep inter-muscular spaces of the limbs, and especially the joints. And this is the case not only as to treatment when the affection has been recognised, but also from the point of view of diagnosis. For examples sometimes occur in which the surgeon, having mistaken hæmophilia for some other condition, adopts a method of treatment which is followed by disastrous results. The two following cases are of considerable importance as showing that hæmophilia may produce symptoms which are practically identical with tuberculous disease of a joint. In such instances, as there may be no known history of hæmophilia, and, at the time, no other manifestations of this affection, the surgeon, by some operation which his belief that he is dealing with tuberculous disease leads him to

undertake, may place his patient in grave danger or, indeed, even sacrifice his life.

CASE I.—A boy, aged ten, was sent to St. Bartholomew's Hospital with, as it was believed, tuberculous disease of his knee of about three months' duration. The joint was somewhat flexed, markedly and uniformly enlarged, and over-warm. Temperature in the axilla 101° to 102° . The child's general health was satisfactory, and nothing was observed to in any way suggest that the diagnosis was at fault. As the joint obviously contained fluid*—which I regarded as inflammatory exudation consisting of synovia, with perhaps a small admixture of pus—I proposed to remove this by means of a trochar and canula. Fortunately, however, on the day before this was to have been done, the child's father came to see him, and casually mentioned to the sister of the ward that the boy was a bleeder.

On hearing this unexpected piece of news I inquired very carefully for any evidence in confirmation of it. I then found three bruise-like discolourations about the trunk and limbs, but these were so faint that they had not attracted attention and might easily have been completely overlooked. Three days later they had entirely disappeared and others, similarly faint and quickly fading, were to be seen. The swelling of the joint disappeared in the course of two months. Since that time there has been no manifestation of hæmophilia. The boy was of unmixed English descent so far as could be ascertained

* In this, as in other cases I have seen, although the joint contained a considerable effusion of blood, there was no discolouration of the surface.

on both his father's and mother's side. He had two brothers who were bleeders.

CASE II.—A boy, aged thirteen, was admitted with what was regarded as tuberculous synovitis of the right knee-joint which had commenced two months previously, and which his mother attributed to a twist when he was playing football. The joint was flexed, considerably swollen, over-warm, and somewhat painful on movement. The temperature in the axilla was 99° to 100° . As in the previous case, there was nothing, at first sight, to suggest to the House Surgeon that the disease was other than tuberculosis. On seeing the patient, however, and hearing his name I remembered that he had been twice in the hospital before with hæmophilia: once with hæmorrhage from the gum after having a tooth extracted, and once with a large bleeding into the cellular tissue in the iliac fossa. His mother I knew was a German, who had married an Englishman; there were two other boys in the family who were both bleeders. One of them had very nearly died of bleeding, from a cut lip, when he was four years old. On examining the patient it was found that he had several faint bruises about him, and that his left ankle was swollen. Both joints were kept at rest on well padded splints, and both slowly returned to a normal condition. He was discharged at the end of five weeks. I have seen him on three occasions since for hæmorrhages, but these have been in the subcutaneous tissue and none of them were serious.

The fact, which Dr. Wickham Legg has established, that hæmophilia is transmitted only through the mother—in other words, that the son of a man who is

a bleeder will be free from the affection—is important. In a boy of this descent an operation may be performed in the confident expectation that no harm will result. I am myself aware of a case in which, in a boy whose father had had three nearly fatal hæmorrhages, circumcision was performed with no more bleeding than usually attends this operation in healthy subjects. It must, however, be remembered that the sons of such a man's sisters would enjoy no immunity; and that operations on them would be attended with an undiminished risk of dangerous or even fatal hæmorrhage.

Fortunately, bleeding due to hæmophilia after surgical operations is very rare in this country. I have never myself met with it in any operation I have performed, either in a child or an adult, whether at the Hospital for Sick Children, where I was frequently operating over a period of twenty-five years, or at St. Bartholomew's Hospital, where a very large number of operations have passed through my hands. The same experience as to the rarity of this condition is derived from the throat department of St. Bartholomew's Hospital, in which, though about four hundred children are operated on for the removal of tonsils or adenoids every year, no case of bleeding due to hæmophilia has yet been met with.

ELIMINATION OF TUBERCLE BY SUPPURATION.

IN the more active forms of tuberculosis of the synovial membrane of the joints, or the cancellous structure of the ends of the long bones suppuration may occur quite early in the case, when one of the pus-producing bacteria finds an entrance to tissues whose powers of resistance have been impaired by the tuberculous process. Suppuration, however, may occur in tuberculosis under quite different circumstances, and bear a different interpretation.

This second set of cases are those in which suppuration takes place late in the disease and results in the formation of the so-called "cold," or chronic abscess. And their history is as follows. During the period in which tuberculosis is active the tissues concerned become occupied by a mixed deposit of tubercle and inflammatory products, the amount of which varies in different instances. In slight cases, which are treated adequately, both in their early stage and onwards, the tuberculous process is arrested, the deposit above mentioned is absorbed, and recovery follows. In other instances, in which the disease is more active, and is allowed to advance, the structures involved become laden with tubercle which is in too large an amount to be absorbed, and

which gradually caseates and undergoes necrosis. Having reached this condition it is virtually a sequestrum and, as such, it produces much the same results as those which follow the presence of a piece of dead bone, or the necrosed fang of a tooth. The surrounding tissues become irritated and inflamed, and at length suppuration takes place, and a cold abscess is formed, in the cavity of which the original deposit is contained.

When such an abscess as this is evacuated and thoroughly cleared the proceeding is virtually an operation for the removal of a sequestrum. And, provided that asepsis is maintained, the same rapid healing is secured as that which follows the removal of a necrosed fang of a tooth or a piece of dead bone. Indeed primary union is frequently obtained. It is easy to see that an abscess formed under these circumstances in a case, for example, of hip disease, may be an advantage. It effects the immediate removal of necrosed material which, so long as it remains, prevents recovery. In those cases, however, in which, when suppuration has occurred around a tuberculous "sequestrum" of the kind just mentioned, if the resulting abscess is allowed to burst spontaneously, the case takes a different course. Suppuration is maintained by the irritation produced by the necrosed tubercle, but at the same time the tubercle is gradually broken down and carried away in the discharge. These two processes, suppuration and the breaking down and elimination of the tuberculous material go on side by side for varying periods in different cases; but in each case till the sequestrum has

been got rid of, or in other words till the tubercle has all been eliminated. In some instances, where the amount of dead tubercle is small, suppuration soon ceases and the sinus heals. In others, in which tubercle is in larger amount, and more widely disseminated, elimination occupies a much longer period. Under these circumstances if sepsis occurs (as is very usually the case) the suppuration is attended with persistent pyrexia, which interferes with the patient's health, and produces wasting, exhaustion, and not rarely lardaceous disease. In such instances the question arises which of two events will be the first to take place. Will the patient's strength be exhausted and a fatal result occur ; or will elimination be completed before this issue is reached ? In the latter event, the source of irritation having been removed, suppuration will quickly diminish and sound healing will be accomplished.

This would seem to be the explanation of the following remarkable case. A boy, aged ten, had become so wasted and enfeebled by hip disease attended with profuse suppuration, that all chance of his recovery appeared to be gone. There were four sinuses about the joint, each freely discharging, and he had an enlarged liver and albumin in the urine, indicating lardaceous degeneration. As he was losing ground the question of amputation at the hip joint was discussed, but it was thought that he would not survive the proceeding. It was on this ground alone that the operation was not performed.

Within a very short time after this conclusion had been arrived at, the boy began obviously to improve, suppuration diminished, and he was stronger and more cheerful. Within three months the discharge

had ceased, all the sinuses had healed, and he was quickly gaining flesh. From this time his recovery was uninterrupted, and he is now in excellent health, and uses the joint, which is ankylosed in a good position, quite freely.

In former years, when almost every case of disease of the hip or spine which went on to suppuration became septic, patients frequently grew so wasted and exhausted that they were regarded as incurable and were discharged. It was, however, observed that not a few presented themselves two or three years afterwards completely recovered; and it was learnt that, after suppuration had continued for varying periods, it had diminished and at length completely ceased: and then the general health had been regained. Such recoveries, I believe, depend on the gradual elimination of tubercle by prolonged suppuration, and they are exactly similar to those recoveries from phthisis in which there has been long continued purulent expectoration.

The remarkable readiness with which tissues that have long been involved in suppuration, in consequence of the presence of some irritant, will recover as soon as the irritant is removed, is well known. This is seen when suppuration which has been going on for two or three years in a case, for instance, of necrosis of the popliteal aspect of the femur, ceases at once when the dead bone is removed. In a case of dental fistula which had existed for seven years, discharge ceased and the wound healed within ten days of the extraction of the necrosed fang of one of the molar teeth.

The importance of bearing in mind that this is the course of events which may ensue in cases

of prolonged suppuration in tuberculous disease, is obvious in relation to treatment. It becomes plain that every possible means must be adopted to promote the removal of tubercle. Sinuses and cavities must be freely laid open and cleared of granulation tissue; and good drainage must be maintained; and this treatment must be repeated, if necessary, from time to time. In a boy, aged about ten, the knee-joint, which had been the seat of extensive tuberculosis, involving the synovial membrane and the articular ends of the bones, was opened and scraped, and carious patches removed on four separate occasions, with the result that at the end of eighteen months sound healing had been secured.

Instances in which, in connection with one of the large joints, suppuration has occurred and septic changes have taken place are much less common than they formerly were. Yet they are still sometimes met with. In such cases the joints concerned must be kept in good position, carious bone must be removed, and drainage and rest maintained: while, if the patient's general condition is such as to make it necessary to consider—for example, in disease of the hip-joint—the question of amputation, the possibility that the elimination of tubercle is almost complete must be remembered, and the operation must not be performed until it has become urgently required. In such instances no absolute rule can be laid down. The course to be taken must be determined by the surgeon who is responsible; but the leaning should generally be towards palliative and expectant treatment rather than towards amputation.

SARCOMA OF THE PROSTATE.

C. P., compositor, *æt.* 57, was admitted into St. Bartholomew's Hospital on May 21, 1895. Two and a half years before he had been in another hospital on account of constipation. The notes taken at the time, a copy of which was kindly supplied by the registrar, stated that he was then suffering from a tumour situated in the left side and lower part of the abdomen. Laparotomy was performed, and the tumour was exposed. It appeared to be a sarcoma, attached to and growing from the left ilium. It was found that it could not be removed, and the wound was therefore closed. After leaving the hospital referred to he repeatedly had retention of urine, for the relief of which a catheter was required. The instrument was always passed quite easily.

When I first saw him in the hospital his abdomen was markedly distended, and a large tumour could be felt in the hypogastric region, and extending towards the left side. The bladder was lying in front of and above the tumour. *Per rectum* a large, firm swelling, some 4 or 5 inches in diameter, could be felt, involving the prostate gland. The urethra was $10\frac{1}{2}$ inches long.

The urine was drawn off daily, and was natural. The patient somewhat rapidly lost flesh and strength,

and as the intestinal obstruction and distension increased, left inguinal colotomy was performed. After the operation however he suffered from vomiting and abdominal pain, and died five days later.

Post-mortem examination showed that the bowel had fallen away at one point from the abdominal wound, and that fæcal discharge had taken place into the abdominal cavity, and had led to acute peritonitis.

The tumour proved to have no bony attachments, and to have taken its origin in the prostate gland. It was about as large as a foetal head. The descending colon and the sigmoid flexure contained several pounds of nearly solid fæces, and it appeared that the weight and dragging action of this mass of fæces had had much to do with the giving way of the sutures. The rectum lay opposite the right sacro-iliac joint. It was greatly compressed in its whole length by the tumour, which filled the pelvis from the triangular ligament upwards, and extended upwards into the abdomen nearly as high as the umbilicus.

The growth measured seven and a half by four and a half by four and a half inches. It was slightly movable upwards and downwards in the pelvis. It had displaced the bladder upwards, so that it lay almost wholly above the pelvic cavity. It had a well-marked capsule, was slightly lobulated, and on section was of a whitish colour and firm consistency. There was no infiltration either of the rectum or the bladder, except at the trigone. The prostatic urethra was much dilated and elongated. One vesicula seminalis was quite free from the growth, the other appeared to be embedded in it.

The liver contained some small white nodules of new growth, and there was a similar nodule as large as a hazel-nut on the spermatic artery, below the right kidney. The kidneys were both slightly dilated. The other abdominal viscera were normal.

Dr. Strangeways Pigg, the Assistant Curator of the Museum, furnished me with the following report on the microscopic structure of the tumour :

“The growth is composed principally of spindle cells and fibrous tissue. In parts of the section almost pure fibrous tissue is seen, arranged in bands and containing a few nuclei; in other parts the growth is more cellular, and in addition to the spindle cells a few large oval nuclei are seen. A well-marked fibrous capsule envelops the tumour.”

Malignant disease of the prostate is rare; yet a considerable number of examples have been recorded. The prostate may be the site of either carcinoma or sarcoma. The few remarks I have to offer will be entirely confined to the latter affection.

Sarcoma of the prostate may be met with at any period of life, from quite early infancy to very advanced age. Barth,* who states that half the recorded cases have been in children between the ages of one and eight years, has recorded an instance in an infant nine months old; Spanton,† one in a boy of five years; while in other cases every decade up to that between seventy and eighty is represented. The oldest patient on the list is a man of seventy-four, who was under the care of Mr. Hurry Fenwick.‡

* *Archiv für Klin.-Chir.*, von Langenbeck, Bd. xlii. 1891, p. 758.

† *Path. Soc. Trans.*, vol. xlii. p. 218.

‡ *Brit. Med. Journ.*, 1887, vol. ii. p. 873.

The symptoms consist mainly of—

(1) Interference with micturition. In some instances, especially in children, this may amount to complete retention. In Spanton's case it was found impossible to pass a catheter, and in the present instance and in several others also the prostatic urethra was found, on post-mortem examination, to have been entirely destroyed by the growth. In other examples, however, in the early part of the disease, micturition has been but little interfered with, and catheters have been passed without difficulty, even up to the time of the patient's death.

(2) Defæcation is some times easily performed, but in the advanced stage it has been rendered difficult by the pressure of the tumour on the rectum. In several cases it has been necessary to perform colotomy.

(3) On examination a tumour occupying the position of the prostate is early felt *per rectum*, and also in children and even in adults by bimanual palpation.

(4) Hæmorrhage, even in the later stages of the disease, appears to be rare. So good an authority as Mr. Henry Morris, however (Treve's "System of Surgery," vol. ii. p. 917), states that "urethral hæmorrhage is the most certain and most constant symptom. It is frequently easily provoked, and often severe." I am not aware on what data this statement rests, but it is not borne out by the cases which I have found recorded in surgical literature. In many instances no mention of hæmorrhage from the urethra is made, while in many it is expressly stated that it is absent. None was observed in the case I have related.

(5) Pain. This varies very much in different cases, but in many it is severe.

(6) The bladder is generally displaced upwards and forwards. In some instances it is pushed almost entirely out of the pelvis into a position behind the abdominal wall, just above the symphysis.

The duration of the disease varies widely in different cases. In the instance I have reported the time cannot be accurately stated. It seems probable, however, that it amounted to four or five years; for the history showed that two and a half years before the patient died he had a tumour large enough to compress the rectum, and induce the belief, when laparotomy was performed, that it was a sarcoma growing from the left ilium. Billroth mentions a case of cancer of the prostate (probably this was a sarcoma) in which the patient survived six years; while, on the other hand, in Spanton's patient, a boy of five, death occurred thirteen weeks after the first symptom (retention) was observed. This difference as to time may largely depend upon age, but it turns also on the structure of the growth. Two main varieties of sarcoma of the prostate are met with. In one—of which the case I have related is a clear example—the tumour, formed chiefly of spindle cells, is dense and tough, and enclosed in a firm capsule. Such a tumour is of slow growth, and although it may attain to a very large size does not tend to break down, and does not break through its capsule and infiltrate neighbouring tissues.

In the other form the tumour grows rapidly, readily breaks down, and tends to infiltrate surrounding parts. This form of the disease is well illustrated

by a specimen, No. 2235, in the museum at St. Thomas's Hospital. Some of the growths have proved on microscopic examination to consist of spindle cells, some of mixed cells, and some again, in children, have been myxo-sarcomata.

In regard to treatment there is no very hopeful tale to tell. A. Stein* relates cases in which removal of malignant growths (but whether these cases were sarcoma or carcinoma we are not told) was undertaken by Billroth, Spanton, Harrison, Czerny, and others ; but the success which has attended operation has hitherto been very small. Death has occurred from shock (Spanton), from septic peritonitis (Billroth), from exhaustion in thirteen days (Harrison), from uræmia, or double pleuro-pneumonia. In no case that I have met with is there any evidence that the patient survived for more than twelve months. Probably in only a small proportion of cases can operative treatment be recommended, while in the majority of cases it is harmful rather than advantageous. In some instances supra-pubic drainage of the bladder is called for ; while in a considerable number left inguinal colotomy is required for the relief of intestinal obstruction, due to compression of the rectum by the growth in the pelvis.

* "Ueber die Exstirpation der Prostata wegen malign. Neubildungen," *Archiv für Klin.-Chir.*, von Langenbeck, 1889.

A CASE OF STRANGULATED HERNIA

IN WHICH THERE WAS NO FLUID IN THE SAC, BUT IN WHICH THE INCLUDED COILS OF SMALL INTESTINE WERE TENSELY DISTENDED WITH BLOOD-STAINED SERUM, MIXED WITH A SMALL AMOUNT OF FÆCAL MATTER: EVACUATION OF THE INTESTINAL CONTENTS BY THREE INCISIONS: CLOSURE OF THESE INCISIONS BY LEMBERT'S SUTURES: RETURN OF THE INTESTINE: RECOVERY.

W. D., *æt.* 38, was admitted in St. Bartholomew's Hospital on the evening of August 16 last year, with the history that as long as he could remember he had had a left inguinal hernia, which had always been reducible, and for which for some years he had worn a truss. Twelve hours before his admission the hernia had come down, and he was unable to return it. He had vomited frequently during the day, and had been in agonising pain. On reaching the Hospital he was approaching a condition of collapse. The hernia, about as large as a foetal head, was distended, tense, and completely dull on percussion, in consequence, as I thought, of a large effusion into the sac. When, however, in the course of the operation the sac was opened, no fluid escaped, but it was found that a coil of intestine had been so forcibly pressed into contact with the inner surface of the sac that its

peritoneal covering had been divided for about an eighth of an inch. This wound was closed by three fine Lembert's sutures. The sac contained about two feet of small intestine, the coils of which were dark-coloured and distended with fluid, which made them so heavy that they seemed on the point of bursting, and rendered their return impossible. The coils were therefore evacuated by three separate incisions, and the incisions were closed by Lembert's sutures. The coils were then returned. The fluid that escaped consisted of a large amount—probably more than a pint—of blood-stained serum, mixed with small quantities of fæcal material. As the patient was in an exhausted condition, and as the sac was large and closely adherent to the surrounding parts, it was thought better not to remove it, but the peritoneal cavity was shut off from the external wound in the following manner. A strong silk ligature was passed by means of a Hagedorn's needle round the neck of the sac on its inner aspect, in such a way as to take up the peritoneum and the subperitoneal tissue. When this ligature was drawn tight it closed the passage as a string of a bag closes its opening. The patient passed a good night, and the next morning was reading the newspaper. The wound healed by primary union.

This case is one, I believe, of great rarity. Effusion of blood-stained serum is, of course, a very common event in cases of acute strangulation, but the effusion in the majority of cases takes place from the serous covering of the intestine so that it collects in the cavity of the sac. Here, however, there was no fluid in the cavity of the sac, but so copious an

effusion of blood-stained fluid had taken place into the canal of the intestine that the coils were greatly distended and heavily weighted by it. Hæmorrhage from the mucous membrane in cases of acute strangulation is, no doubt, met with, in a small amount, in many instances, but the condition that I have described is, so far as I know, very seldom found. I have thought that the following considerations might perhaps explain it. If we suppose that the intestine, when strangulation occurred, became, as is frequently the case, paralysed and distended with flatus, its external or peritoneal surface would be forced against the interior of the wall of the sac. In this condition the vessels would be well supported on this aspect. Under these circumstances, when there was difficulty in the return of blood from the imprisoned intestine, any exudation that occurred would take place not on the peritoneal, but on the mucous surface of the intestinal wall. In other words, it would take place into the interior of the intestine and not into the sac.

The method adopted for closing the neck of the sac, and so shutting off the peritoneal cavity from the external wound, is one that perhaps might be used in other cases with advantage, when it is necessary to complete an operation for strangulated hernia with as little delay as possible.

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